Heating Piping & Air Conditioning

MAY 1957

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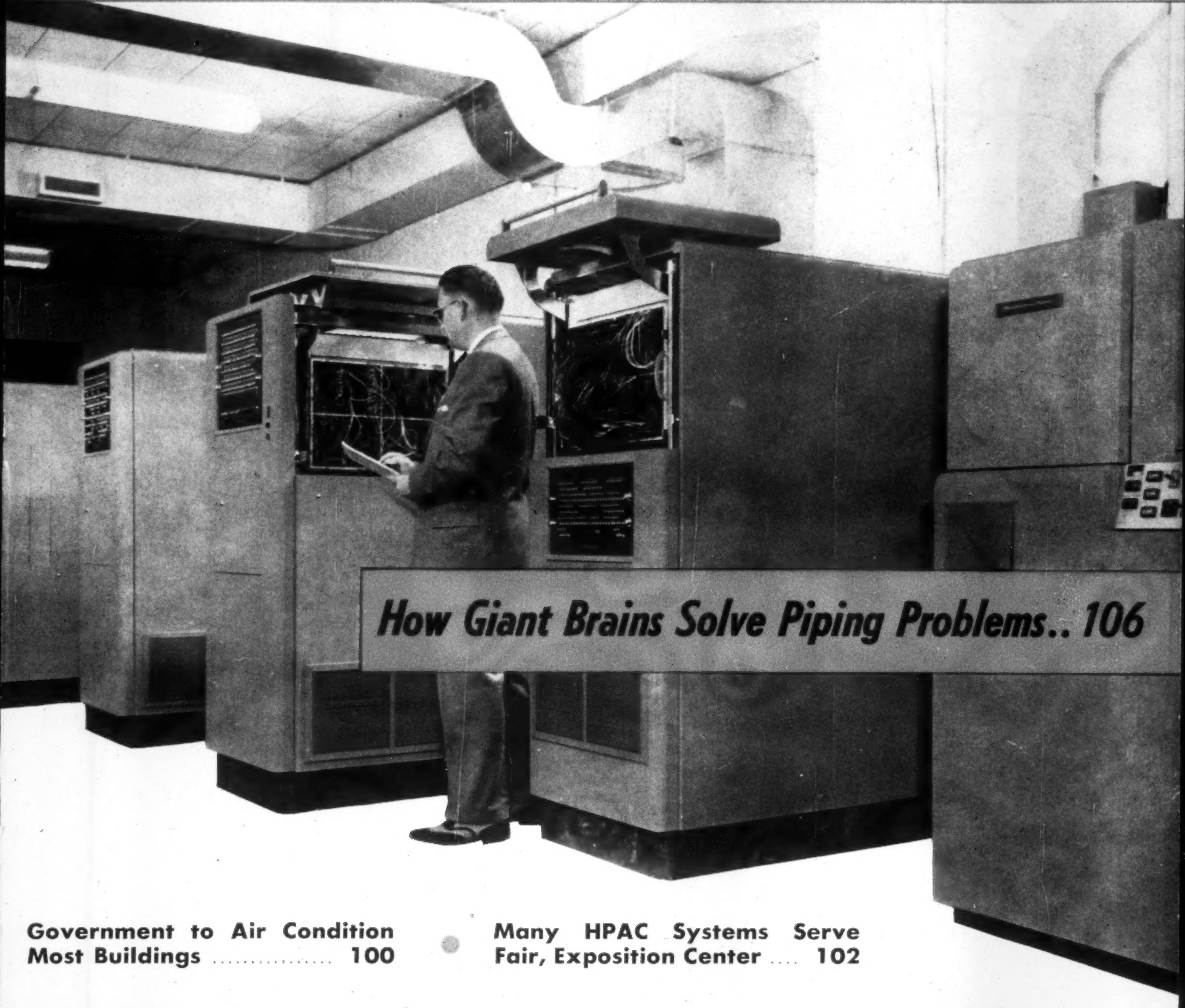
INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Journal Section of the American Society of Heating and Air-Conditioning Engineers—135



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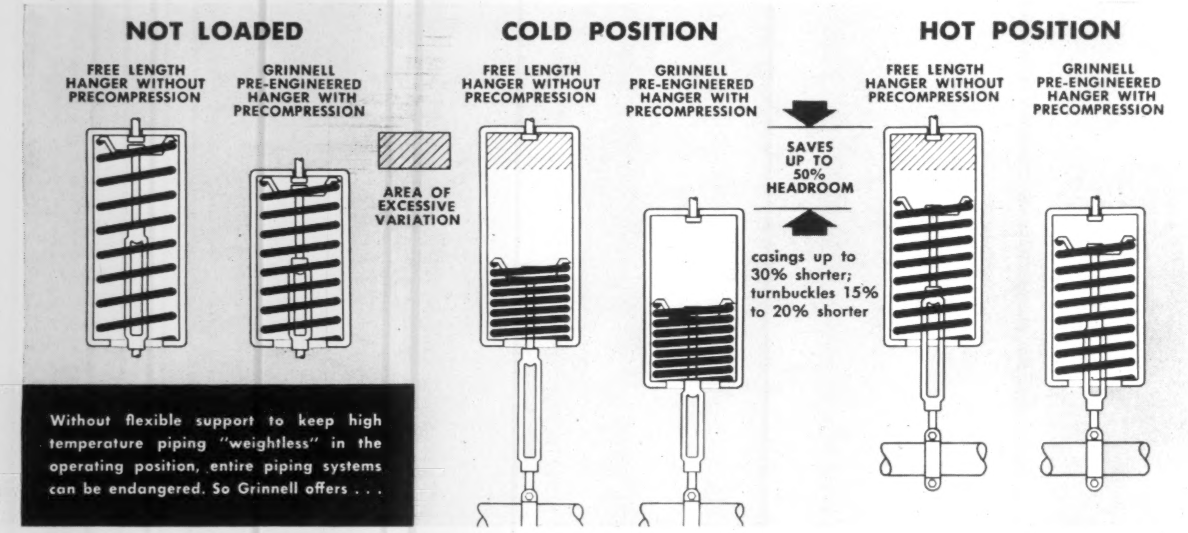

NOT LOADED
FREE LENGTH HANGER WITHOUT PRECOMPRESSION
GRINNELL PRE-ENGINEERED HANGER WITH PRECOMPRESSION
AREA OF EXCESSIVE VARIATION
COLD POSITION
FREE LENGTH HANGER WITHOUT PRECOMPRESSION
GRINNELL PRE-ENGINEERED HANGER WITH PRECOMPRESSION
SAVES UP TO 50% HEADROOM
casings up to 30% shorter; turnbuckles 15% to 20% shorter
HOT POSITION
FREE LENGTH HANGER WITHOUT PRECOMPRESSION
GRINNELL PRE-ENGINEERED HANGER WITH PRECOMPRESSION

Without flexible support to keep high temperature piping "weightless" in the operating position, entire piping systems can be endangered. So Grinnell offers . . .

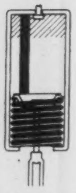
Precompressed Hangers for Safer Support of Piping

Helical coil springs are widely used in hangers for flexible support of piping which moves up or down during thermal expansion. The A.S.A. code for pressure piping requires that variable spring hangers support at least a minimum of 75% of the pipe's weight for a pipe that rises (relaxing the spring) and no more than 125% of the pipe's weight for a pipe that lowers (compressing the spring) during operation.

Precompression patented Grinnell principle

To guard against the spring's supporting force exceeding the limits of variation, Grinnell developed and patented a variable spring hanger design. The steel casing holds the spring permanently precompressed, at the threshold of the hanger's working load range. This prevents the spring decompressing into its area of excessive variation.

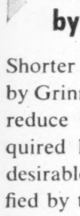
Pre-set is not a substitute



As a partial substitute for this patented precompression, some manufacturers insert a spacer between the top end of a free-length hanger casing and the spring to hold the spring's height temporarily within the working range during shipment and erection.

Another device requires the manufacturer to drill symmetrically opposite holes in the casing walls and insert a bolt to hold the spring's height within the working range. When these devices are removed from the hanger and discarded, the spring can decompress, resulting in high variability in supporting force.

Cold-setting a universal factory service



For the erection crew to avoid having to compress the spring down to the erected position, the manufacturer can compress the spring down to this height. Grinnell can provide a cold-set bolt in precompressed hangers.

Less headroom required by Grinnell Hangers

Shorter hanger casings made possible by Grinnell's patented precompression, reduce bulk shipping weight and required headroom by eliminating undesirable height. Installation is simplified by this shorter casing and also by an integral load scale with load indicator.

Additional headroom is saved by a correspondingly shorter turnbuckle. These precompression advantages are available in short spring and double spring models as well as standard spring models.

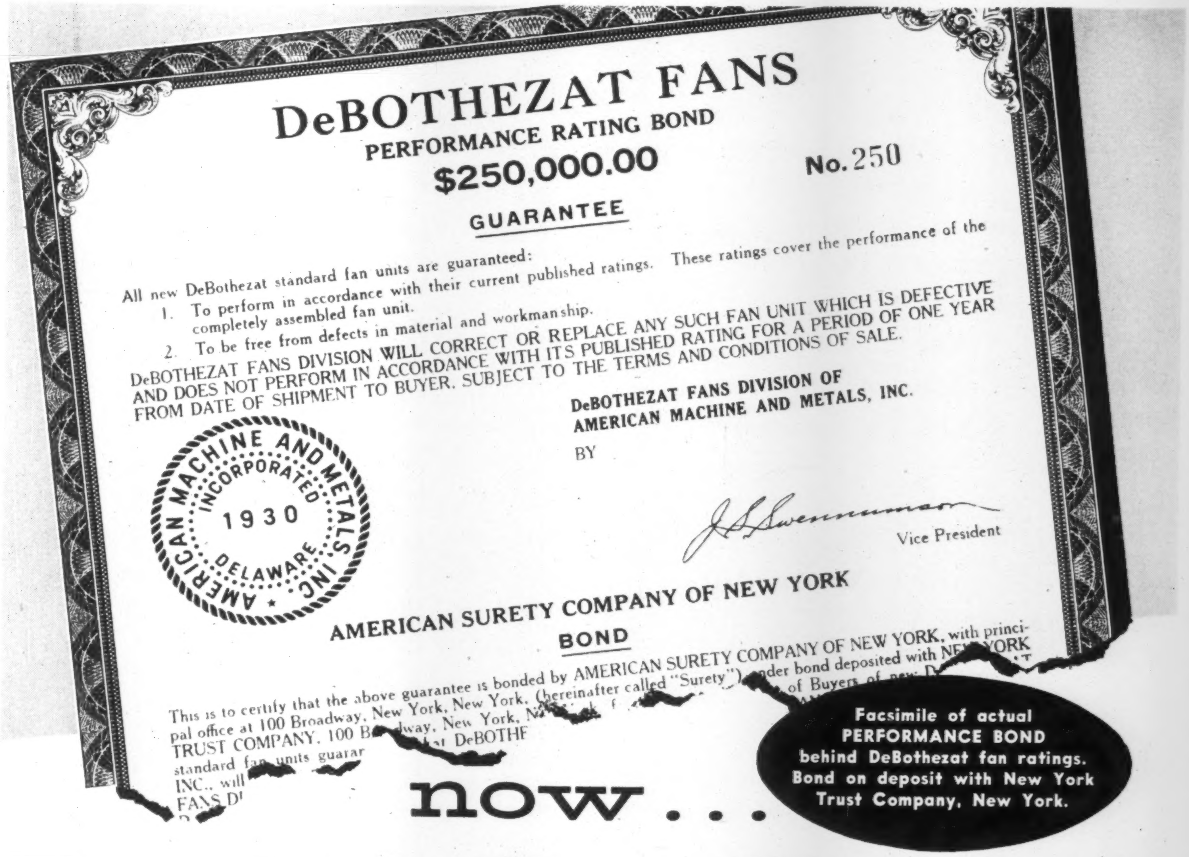
Refinery piping supported safely, with ample flexibility but low headroom.

Available in 63 standard units

Grinnell Variable Spring Hangers are available in 21 sizes each of short, standard and double spring models . . . for maximum travel of 1¼, 2½ and 5 inches respectively within working load ranges. Load capacities extend from 43 lbs to 30,550 lbs. The maximum variation in the standard size per ½-inch deflection is 10½% of rated capacity; inversely proportional in short spring and double spring models.

For further information

If you have a pipe suspension problem, you are invited to write: — Grinnell Company, Inc., 272 West Exchange Street, Providence, R. I.



DeBOTHEZAT FANS
PERFORMANCE RATING BOND
$250,000.00
No. 250

GUARANTEE

All new DeBothezat standard fan units are guaranteed:
1. To perform in accordance with their current published ratings. These ratings cover the performance of the completely assembled fan unit.
2. To be free from defects in material and workmanship.

DeBOTHEZAT FANS DIVISION WILL CORRECT OR REPLACE ANY SUCH FAN UNIT WHICH IS DEFECTIVE AND DOES NOT PERFORM IN ACCORDANCE WITH ITS PUBLISHED RATING FOR A PERIOD OF ONE YEAR FROM DATE OF SHIPMENT TO BUYER. SUBJECT TO THE TERMS AND CONDITIONS OF SALE.

DeBOTHEZAT FANS DIVISION OF
AMERICAN MACHINE AND METALS, INC.

BY

Vice President

AMERICAN MACHINE AND METALS, INC.
INCORPORATED
1930
DELAWARE

AMERICAN SURETY COMPANY OF NEW YORK

BOND

This is to certify that the above guarantee is bonded by AMERICAN SURETY COMPANY OF NEW YORK, with princi-
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TRUST COMPANY, 100 B dway, New York, N of Buyers of new D
standard fa units guarar at DeBOTHF
INC., will
FANS D

Facsimile of actual
PERFORMANCE BOND
behind DeBothezat fan ratings.
Bond on deposit with New York
Trust Company, New York.

now . . .

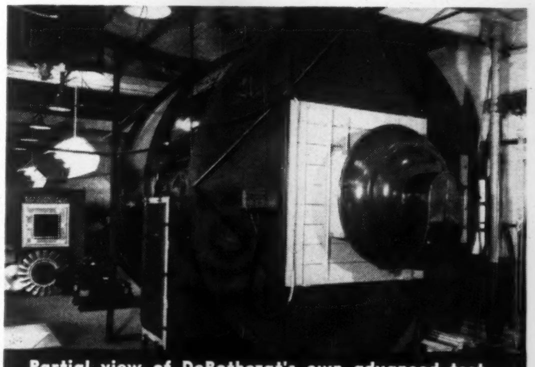
Bonded Fan Ratings

You can depend upon all DeBothezat fan ratings because they are *bonded*. When you select a DeBothezat fan by its published rating, do so with confidence. No guesswork — no allowance to be on the safe side.

All DeBothezat fan performance ratings are *bonded* by the American Surety Company and this bond is on deposit with New York Trust Company, New York.

This is your positive assurance that a DeBothezat rating is what the *complete* fan unit actually puts out.

Remember, you can depend on DeBothezat fan ratings because they're BONDED.



Partial view of DeBothezat's own advanced testing facilities. Accurate wind tunnel tests are made here in accordance with the appropriate NAFM plate . . . conform to U. S. Dept. of Commerce Standard 178-51.

De Bothezat FANS
A DIVISION OF
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

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Dunham-Bush acquires Brunner Mfg. Co.

The Dunham-Bush acquisition of the Brunner Manufacturing Company and its subsidiary, The Brunner Company, brings under one management the manufacture of well established lines of heat transfer equipment and accessories, as well as condensing units and compressors, to satisfy the requirements of the Air Conditioning, Refrigeration, and Heating Industry.

What this means to YOU . . .

The combining of these two well established companies signifies greater things to come for our industry. Combined research facilities and enlarged staffs of skilled development engineers provide the means for continued advancements in new and improved products.

Our prime obligation is to serve the best interests of our rapidly growing industry — to assist in every way possible the realization of its full potential. Dunham-Bush, with the acquisition of Brunner, is better equipped than ever to fulfill that obligation. You can expect improved service and delivery on all our products . . . the assistance of our expanded engineering staff in solving your application problems.

We intend to prove to you that you benefit most when you entrust your air conditioning, refrigeration and heating orders to one source — one responsibility.

Thanks to our Dunham-Bush and Brunner customers for their continued cooperation.

Cecil Boling
PRESIDENT

Dunham-Bush, Inc.

WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH

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Heating Piping & Air Conditioning

Vol. 29 No. 5

(With which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION
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Published monthly by the Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill. Telephone: STate 2-6916. Subscriptions: U.S. and possessions, $3.00 per year; Canada, Cuba, Mexico, Central America, South America, $4.00 per year; other, $6.00. Current copies, U.S. and possessions, 35c each; back copies, 60c each. January 1957 issue $1.50 per copy. For change of address, notify publisher and your local postoffice of both old and new addresses by the 8th of the preceding month. Member Audit Bureau of Circulations, Associated Business Publications, Inc., and Magazine Publishers Association, Inc. Heating, Piping & Air Conditioning is indexed regularly by Engineering Index, Inc., and Industrial Arts Index and is microfilmed by University Microfilms. ©1957 by the Keeney Publishing Co. Entered as Second Class Matter May 18, 1929, at the Post Office at Chicago, Ill. U.S.A. under the Act of March 3, 1879. Additional entry at Mendota, Ill.

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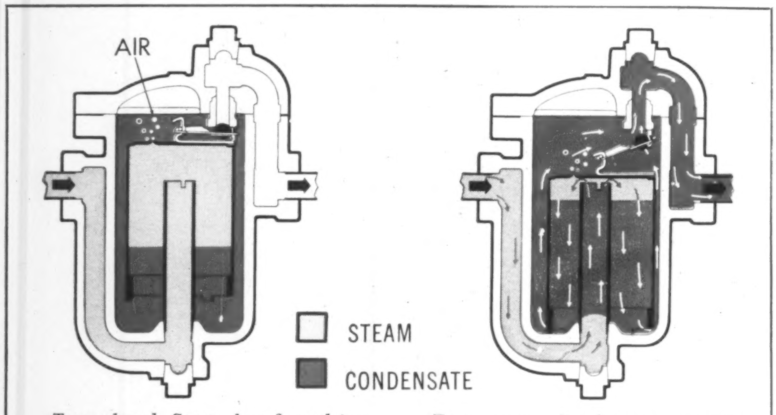
One of a series.

Some Things to Think About Steam Traps

... in order to get high operating efficiency and a minimum of maintenance



Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

The gentleman who invented the wheel had a basic idea and so far no one has come up with anything better for the purpose.

If you'll pardon us for a little overemphasis on the significance of steam traps, we'd like to liken one of them to the wheel.

In 1911, when the first Armstrong inverted bucket steam trap model was announced to the world, or at least that part of the world that modest advertising and sales budgets would cover, it was not received with equal enthusiasm by all (especially old-style trap makers). But, like the wheel, it managed to find its way into general use. And, nothing better has ever turned up for the purpose of draining condensate. As a matter of fact, the Armstrong trap has been very widely copied. Today, there are more inverted bucket traps draining process equipment than any other kind. Of these, there are more Armstrongs.

If this sounds like the boasting of a proud parent, give consideration to some fundamental requirements not met by all traps:

1. ***A steam trap should not leak steam.*** Some traps do, you know, because of the nature of their operating principle. No steam ever gets to the Armstrong trap orifice. The valve is always water sealed.

2. ***A steam trap should vent "air" as fast as it accumulates***—otherwise temperatures are reduced and corrosion is a problem. The Armstrong trap handles air very nicely. The vent in the bucket permits air to accumulate in the top of the trap, from where it is discharged when the trap opens. For extreme conditions like draining paper machine dryers, some jacketed kettles and certain other units, the vent is sized larger for the job. And, for handling big volumes of air during warm-up, a bucket with an auxiliary thermic vent really speeds up heating.

3. ***A steam trap should discharge condensate at steam temperature*** if you want to get maximum efficiency from the unit drained. And most people certainly do. If you have to wait for the condensate to cool, it's almost impossible to maintain maximum temperatures and prevent air build-up. You guessed it—the Armstrong trap opens for water, without dependence on temperature.

4. ***A steam trap should be suitable for any return system.*** The Armstrong trap works just the same whether discharging to atmosphere, back pressure or vacuum. It has been conclusively proved that flash steam resulting from use of a bucket trap does not cause a problem in vacuum return systems. The flash condenses rapidly. It's the leaky traps that cause the headaches.

5. ***A steam trap should not be a "prima donna".*** Some kinds of traps take an awful lot of care and coddling. The Armstrong trap is a rough and ready type with a hardened chrome steel constitution (valve and seat, to be exact). It cleans itself of ordinary dirt and scale without choking up. Its 18-8 stainless parts stave off rust and corrosion. It resists wire-drawing and wear remarkably well. In fact, it stays on the job longer with less attention than any trap ever produced. Unless you live in Siberia, you can probably find a user around the corner who will tell you so from experience.

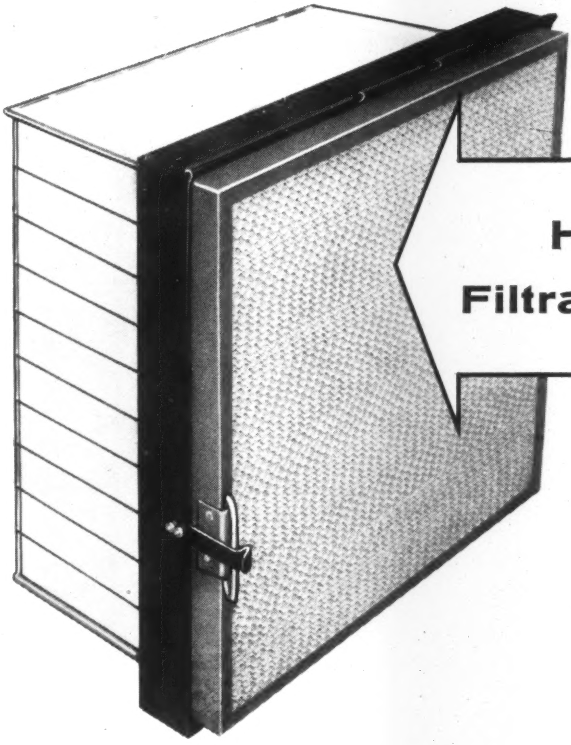
6. ***A trap should not be an "orphan".*** With Armstrong traps you can *always* get prompt service and parts from nearby Factory Representatives and stocking distributors as well as from the factory.

7. ***A trap should have a guarantee.*** The Armstrong trap is unconditionally guaranteed to give you *complete satisfaction* (as to doing its job, that is). If it doesn't, you can get your money back.

If you'd like to buy some of these excellent steam traps, call your local Armstrong Representative or write **Armstrong Machine Works, 8745 Maple St., Three Rivers, Michigan.**

ASK FOR the 44-page Steam Trap Book, free on request without obligation.

ARMSTRONG STEAM TRAPS

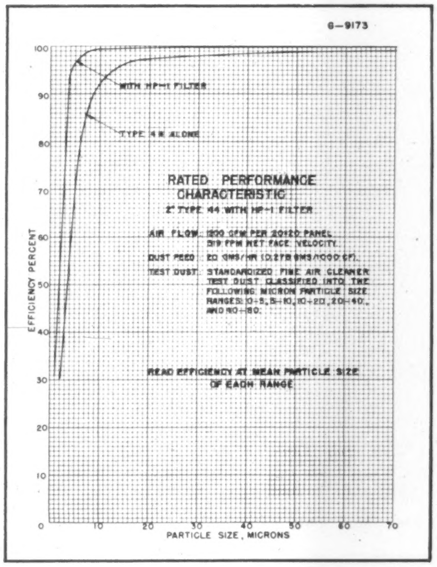


High Efficiency Air Filtration at Lowest Cost!

FAR-AIR TYPE HP

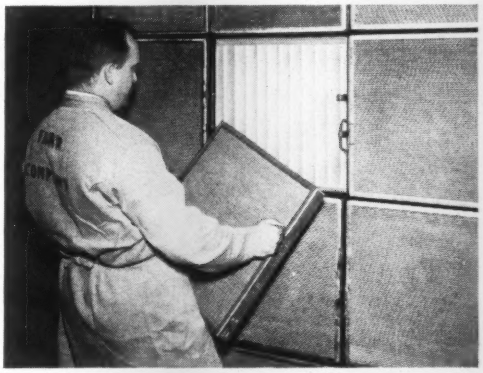
PAPER FILTER

Here is an inexpensive paper after-filter that, when used in conjunction with your present permanent filters, gives air cleaning efficiency that rivals that of the most expensive equipment . . . *at only a fraction of the cost!* Perfected after years of research, this flame-proof filter with its specially crimped media is ideal for situations where airborne dirt is critical yet budget is a factor. When used in combination with the Far-Air panel filter, dust particles as low as 2 microns in size are effectively removed. In addition to lowest first cost, the HP has a longer service life and can be replaced for pennies.



FAR-AIR HP AT A GLANCE

- *Installs without tools or special equipment*
- *Zinc plated wire frame*
- *9 to 1 filtration area to face area*
- *20 sq. ft. filtering area*
- *High velocity, minimum pressure drop*
- *Size: 20" x 20" x 8"*
- *Low replacement cost*
- *Flame-proof*



Type HP in place behind a standard FAR-AIR filter.

The HP is provided with a zinc plated wire retainer that clamps easily on most present filter holding frames. It is quickly installed without special tools. The special, flame-proof paper media gives trouble-free service.

So, where super air cleaning is a necessity, the FAR-AIR Type HP offers an excellent solution. Write for complete technical data.

FARR
COMPANY
LOS ANGELES • NEW YORK • CHICAGO • NEW ORLEANS

Manufacturing Licensees:
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Originators of **FAR-AIR** *Certified Filter Service*

Report No. 1 of a series

I used to freeze solid until I found

Kathabar® systems deliver air continuously at dry bulbs and dew points down to minus 90 F

You know how much money you could save your company if you could get a continuous supply of air at conditions anywhere below 32 F dry bulb and dew point. You also know how free you could be if you didn't have to worry about frost, coolant temperature, and any other obstacles to low-temperature operation.

These profits are immediately available to you in a Kathabar-engineered air conditioning system. Specify any sub-freezing air conditions you require, and Kathabar engineers will meet your specs with a system which is economical, continuous, automatic, and simple.

sample conditions

The conditions you want may be in this group of Kathabar-engineered installations:

PROCESS	AIR OFF *dry bulb*	KATHABAR *dew point*
Ordnance testing	-90 F	-100 F
Wind tunnel	-47 F	-61 F
Candy bar chilling	0 F	-19 F
Photo film chilling	6.5 F	2 F
Glass laminating	23 F	-2 F
Brewing	28 F	10 F
Chemical processing	24 F	5 F

These samples merely hint at the versatility of Kathabar systems. They will give you dew points as low as minus 90 F under pressure or vacuum, if you want them.

pay-off points

To you, the possibility of a continuous process at sub-freezing air temperatures might be the greatest advantage of a Kathabar system. To someone else, its precise control of dry bulb and dew point is the chief attraction. Others say they gain most from Kathabar engineers' knowledge of materials and processes.

All Kathabar low-temperature applications have clear advantages in common. They tremendously increase cooling efficiency by eliminating frost. This prevents refrigeration freeze-ups, avoids cyclic operation, and often gives better cooling with less tonnage.

They eliminate defrosting shutdowns and the need for duplicate coils.

With "Kathene" solution, the most potent chemical absorbent known, a 10 F to 25 F dew point depression may be obtained between the outlet air dew point and the cooling medium temperature. There is no need to cool the air or the absorbent to the desired dew point temperature. There is exact control of dew points without vaporization or "carryover." Regeneration of the absorbent is automatic and continuous.

Operation and maintenance are simple and economical. In many cases, Kathabar systems can be adapted to existing air conditioning systems.

who uses Kathabar systems

Kathabar systems make profits out of air for these industries:

- Atomic Energy
- Breweries
- Cake Mix
- Candy
- Cellophane
- Cellulose
- Cereals
- Chemicals
- Coffee
- Comfort
- Compressors
- Cookies
- Electronics
- Explosives
- Film
- Foundries
- Gelatin
- Glass
- Glue
- Gum
- Hospitals
- Hotels
- Lacquer
- Lenses
- Machining
- Marine
- Matches
- Meat
- Offices
- Ordnance
- Paper
- Pharmaceuticals
- Plastics
- Printing
- Rockets
- Rubber
- Sanitaryware
- Shellac
- Sugar
- Testing
- Textiles
- Transformers
- Transistors
- Vacuum Tubes
- Varnish
- Waterworks
- Wire
- Yeast

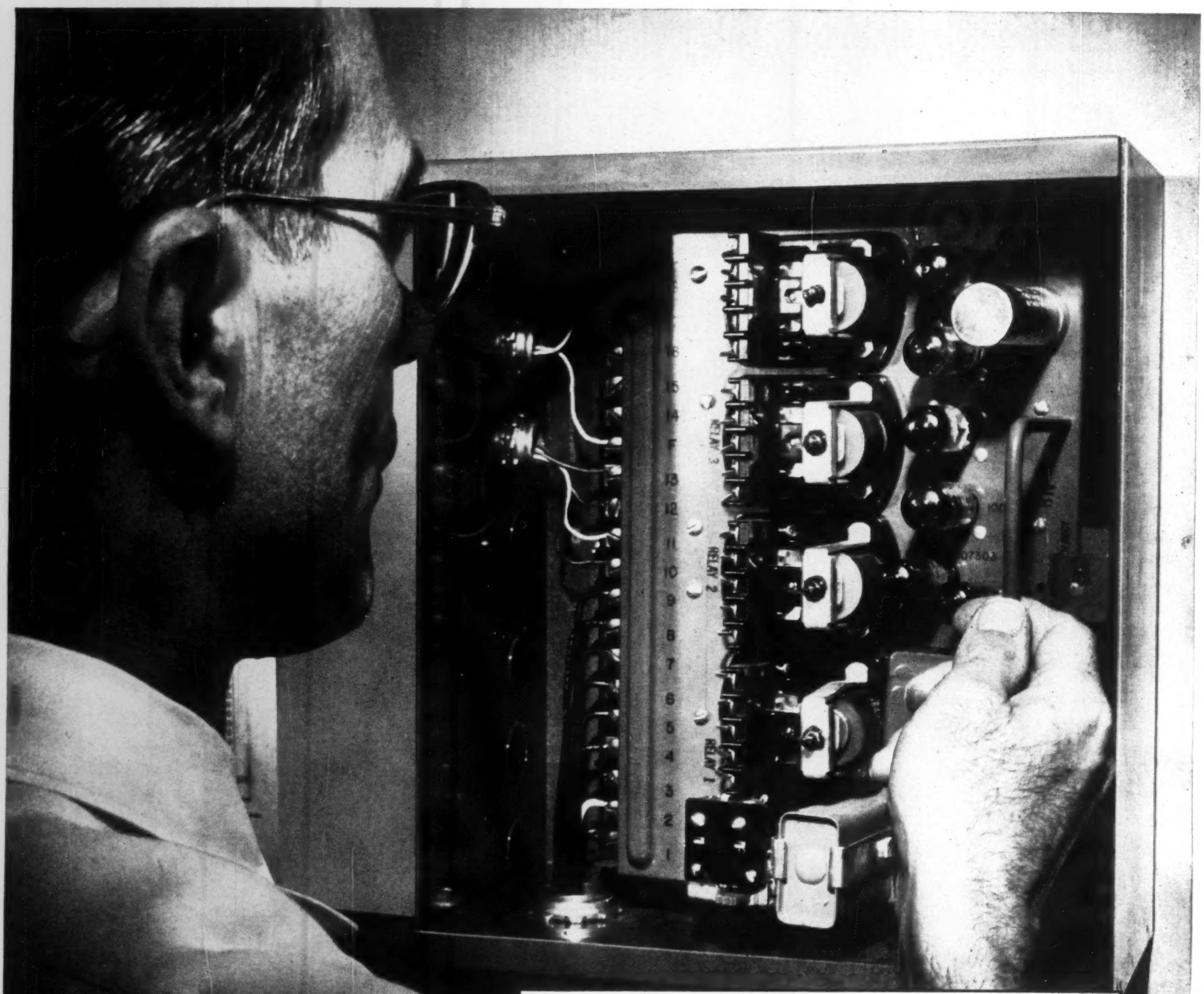
how they use Kathabar systems

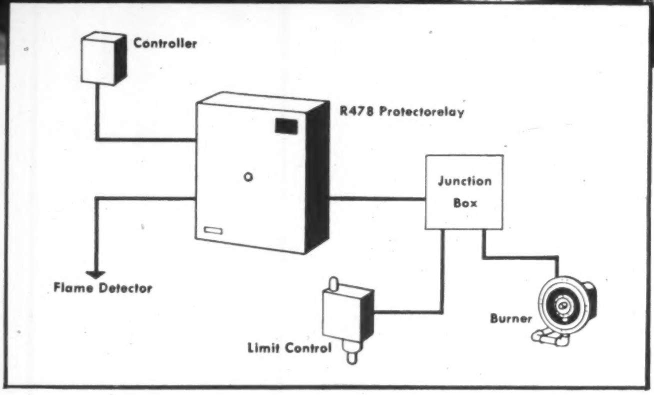
Many of these industries use Kathabar systems for obtaining continuous air at sub-freezing dry bulbs and dew points. Others use them to (1) maintain spaces below 80 F and 55% RH; (2) deliver sterile air at specified dry bulb and dew point; (3) eliminate wet floors, walls, equipment; and (4) improve drying processes.

Write for additional information; you'll get it by return mail.

Air Conditioning and Drying Division
SURFACE COMBUSTION CORPORATION
2384 Dorr Street Toledo 1, Ohio

Kathabar systems by Surface




Controller
R478 Protectorelay
Junction Box
Flame Detector
Limit Control
Burner

The new R478 Protectorelay* you see being installed above assures you a safe start after each power interruption regardless of length or cause. Every time power returns, the electronic network must prove itself to be safe before the burner can be started. With power on during stand-by the electronic circuit checks itself continuously. The R478 responds instantly to flame failure, providing immediate burner shutdown and post purge.

A flame safeguard for commercial burners

New Honeywell R478 Protectorelay*

gives your customers the ultimate in

Safety • Performance • Flexibility

- **Choice of flame detection**—R478A for flame rectification (flame sensing rod and photo cell). R478B for Flameguard (lead sulphide cell).
- **Choice of burner sequencing**—choose from:
  - Pre-purge period either 5 or 30 seconds.
  - Proved or unproved pilot or direct ignition.
  - Intermittent or interrupted pilot.
  - Ignition timing either 15 or 60 seconds.
  - Low fire start with return to firing rate control either when main fuel valve opens or at end of ignition period.

In combination gas-oil burners one sequence can be selected for gas firing, another for oil firing.

- **Choice of manual or automatic starting.**
- **Wide selection of voltage**—voltage selector permits use on 120, 208 or 240-volt 60 cycle service. Separate model available for 50 cycle.
- **Broad range of applications**—precision engineered for large conversion burners—such as horizontal rotary, mechanical, air or steam atomizing and forced draft gas—also for steam generators and floor standing heaters.
- **Fast dependable electronic detection and timing**—R478 responds *instantly* to flame failure. Then, vacuum-tube rectifiers assure uniform electronic timing of sequences.
- **Easy to install.**
- **Lower maintenance costs**—Time-proven Honeywell components—unaffected by friction, dust or corrosion—assure constant efficient operation.

Honeywell manufactures a complete line of heating controls for all types of oil and gas burners. With Honeywell you can rely on one supplier for all of your controls. For information on the R478 or on any of our other controls, call your local Minneapolis-Honeywell office. Or, write Dept. HA-5-140, Minneapolis 8, Minn.

Honeywell

H HONEYWELL *First in Controls*

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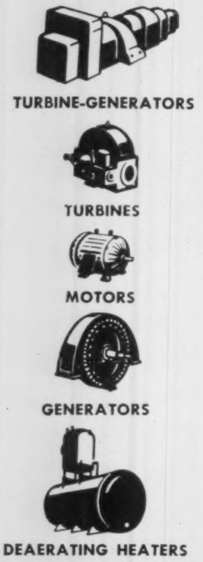
ELLIOTT PRODUCTS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TURBINES
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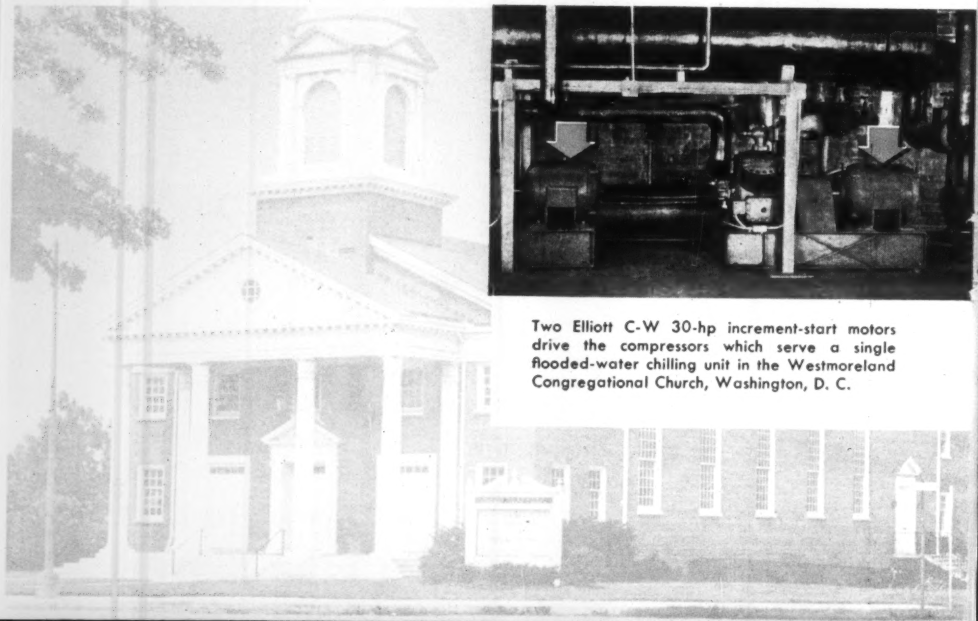
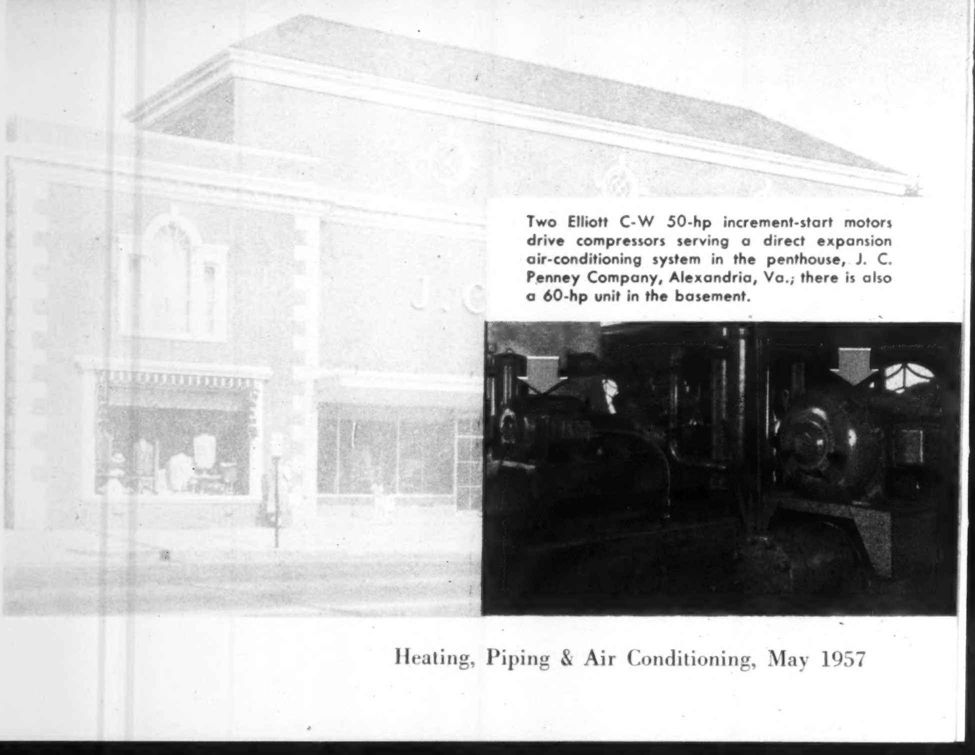
GENERATORS
DEAERATING HEATERS



Two Elliott C-W 30-hp increment-start motors drive the compressors which serve a single flooded-water chilling unit in the Westmoreland Congregational Church, Washington, D. C.

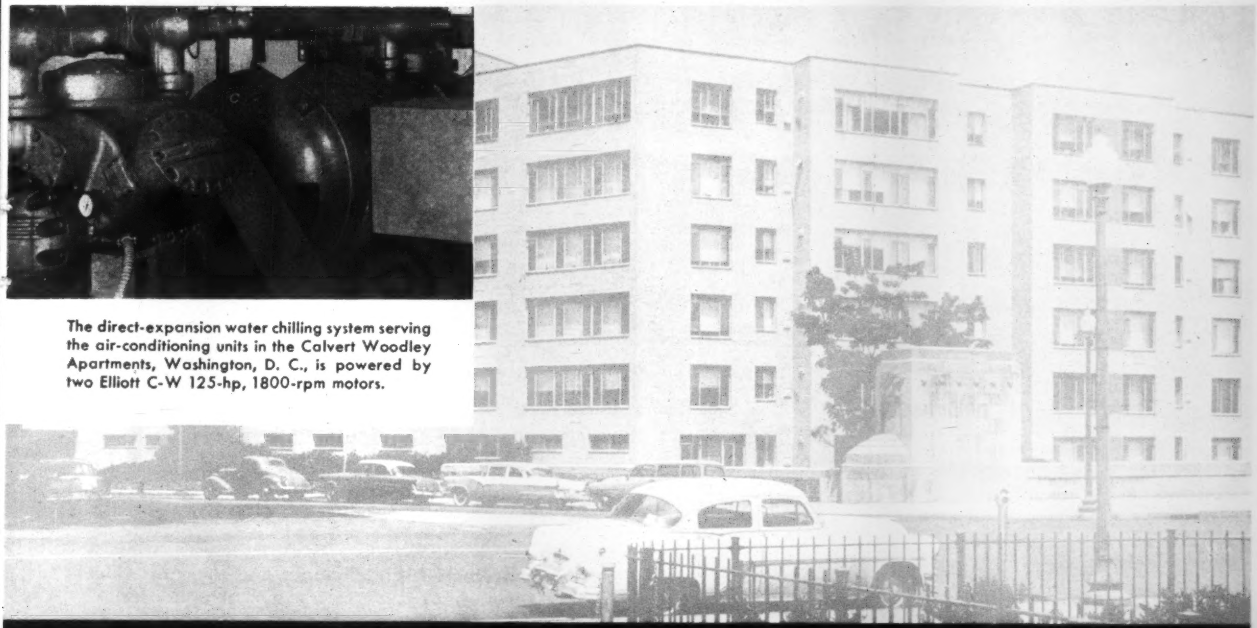
ELLIOTT Crocker-Wheeler motors bring COOLING COMFORT to the Nation's Capital

EJECTORS
CONDENSERS
COMPRESSORS
TURBOCHARGERS
TUBE CLEANERS
STRAINERS



Two Elliott C-W 50-hp increment-start motors drive compressors serving a direct expansion air-conditioning system in the penthouse, J. C. Penney Company, Alexandria, Va.; there is also a 60-hp unit in the basement.

W7-2



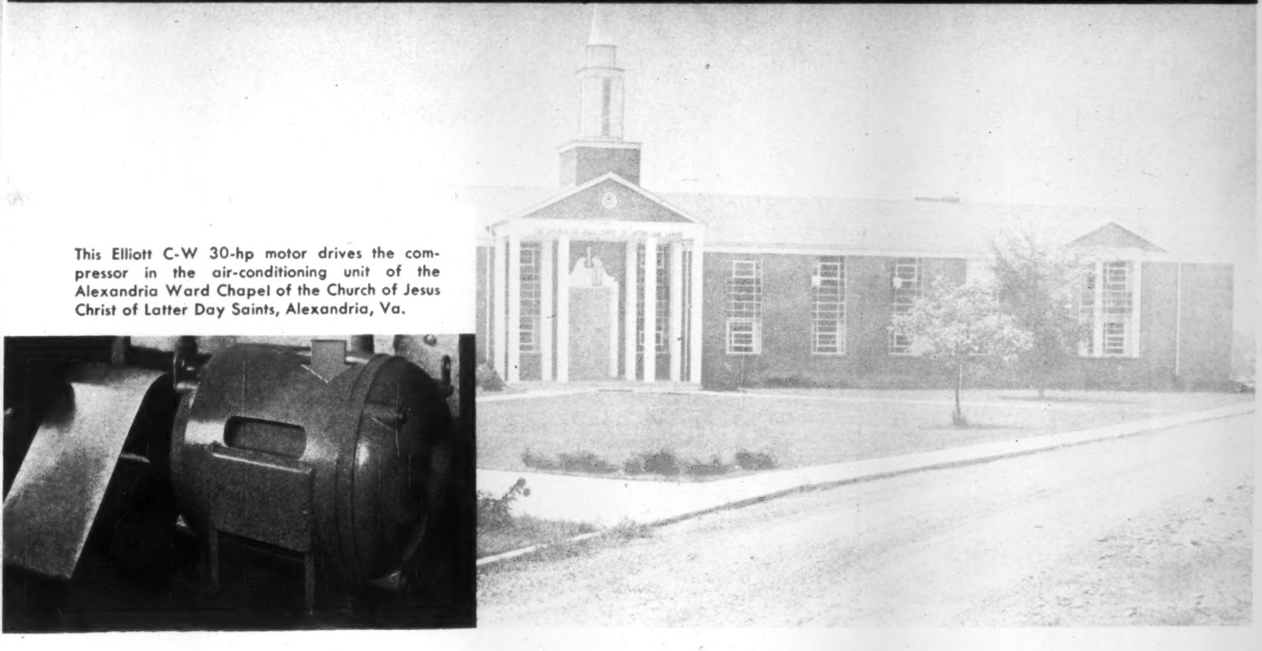
The direct-expansion water chilling system serving the air-conditioning units in the Calvert Woodley Apartments, Washington, D. C., is powered by two Elliott C-W 125-hp, 1800-rpm motors.

These Elliott C-W motors serving Carrier air-conditioning units in or near Washington, D.C., are only a few examples of what is happening in cities all over the country. Because of their superior performance and long-term dependability, the popular Elliott C-W motors are repeatedly selected to drive compressors, pumps, and other auxiliary equipment.

* * *

For details, contact your nearby Elliott district office, or write Elliott Company, Crocker-Wheeler Division, Jeannette, Pa.

ELLIOTT Company



This Elliott C-W 30-hp motor drives the compressor in the air-conditioning unit of the Alexandria Ward Chapel of the Church of Jesus Christ of Latter Day Saints, Alexandria, Va.

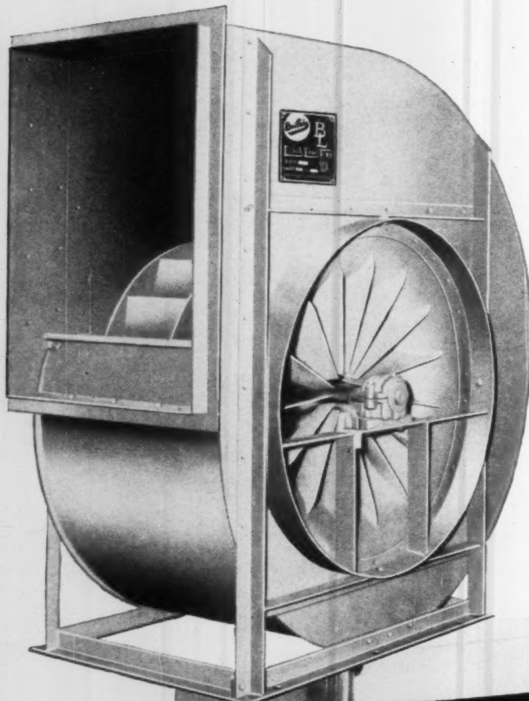
NO COMPROMISE!

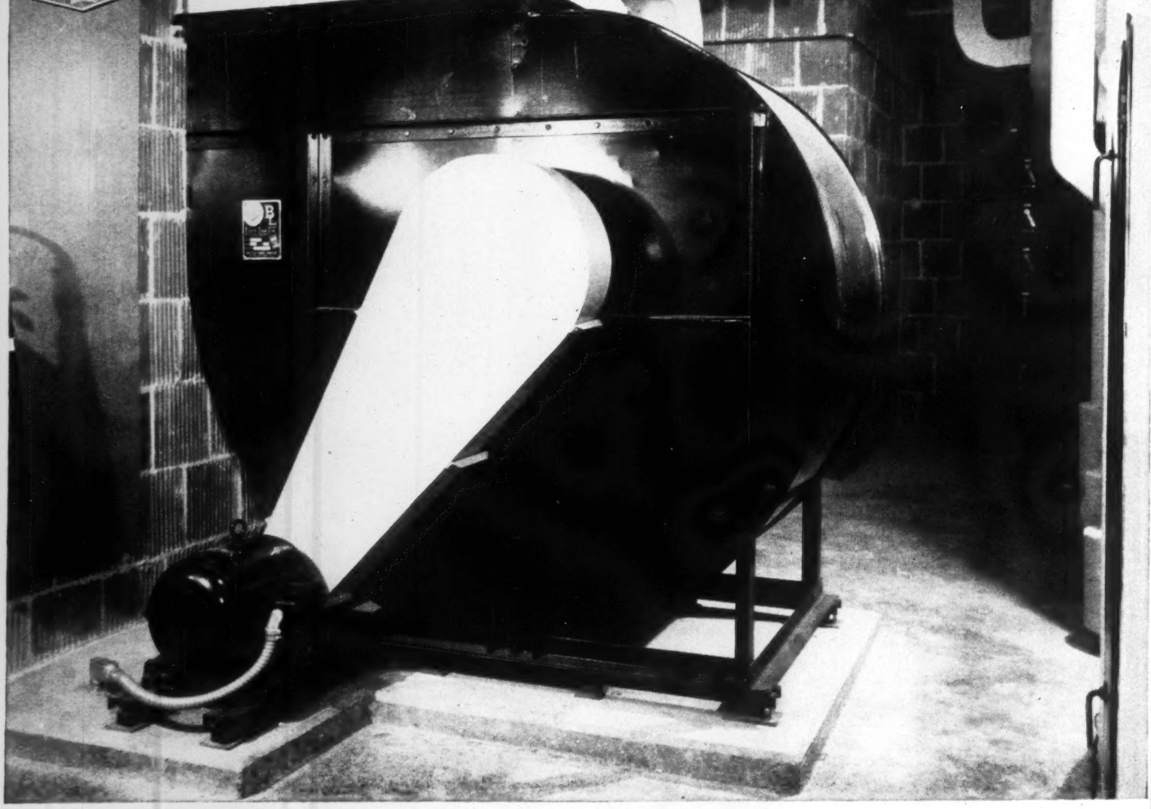
"BUFFALO" TYPE "BL" FAN FOR YOUR LARGE-SYSTEM, MODERATE PRESSURE JOBS

The "Buffalo" Type "BL" Ventilating Fan offers the most desirable characteristics for Class I air moving of any fan in our 80-year history of building quality fans:

1. Stable performance from free delivery to shutoff.
2. Extremely high efficiency and low noise level throughout the entire range of operation.

Exclusive "Buffalo" features such as directional inlet vanes — the smoothly curved inlet bell exactly matching the curve of the wheel flange — backward curved blades and the full-curvature housing — have offered contractors and users the ultimate in satisfaction on many of the largest installations. Write for Bulletin F-102 for all details on this fan in 1000 to 500,000 cfm capacities.





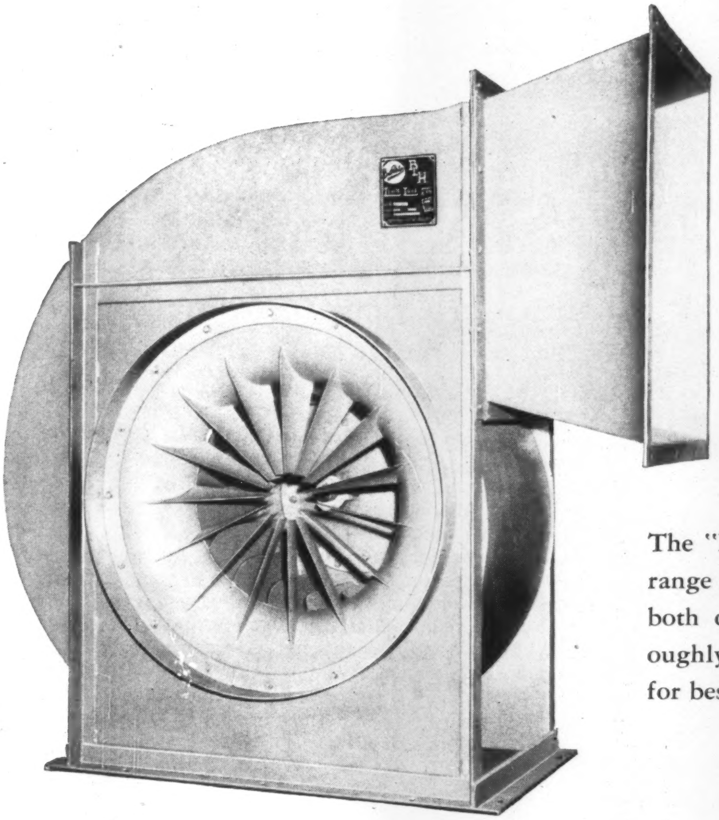
"Buffalo" Type "BL" Limit-Load Fan supplying a large system in a building of a major telephone company. Limit-Load® characteristic makes it impossible to overload the "BL."

THE RIGHT FAN FOR EVERY JOB!

"BUFFALO" TYPE "BLH" FAN FOR YOUR LARGE-SYSTEM, HIGH-PRESSURE JOBS

For Classes II-IV air moving, as in high-pressure conduit service, the new Type "BLH" Limit-Load® Fan provides mechanical efficiency in excess of 80% over a broad range of pressure and volume conditions. Its years-ahead design includes:

- Cantilevered directional inlet vanes for stable air flow. "Buffalo" variable inlet vanes can be used with no appreciable loss in efficiency.
- The same smooth inlet bell and dished rotor shroud, the same backward curved blades that have proved so effective in controlling turbulence in the Type "BL" Fan.
- The startlingly efficient new divergent outlet, which eliminates a major source of outlet turbulence — providing a *gradual* change from outlet velocity at cutoff to static pressure in the duct.



The "BL" & "BLH" cover the wide pressure range found in today's ventilating systems — both outstanding in their place, both thoroughly proven, both offered to you by "Buffalo" for best results.

BUFFALO FORGE COMPANY
BUFFALO, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING · AIR CLEANING · AIR TEMPERING · INDUCED DRAFT · EXHAUSTING · FORCED DRAFT · COOLING · HEATING · PRESSURE BLOWING

Whether you use tons, horsepower or BTU's as a yardstick . . . efficient air conditioning is dependent on smooth, quiet, trouble-free bearing performance!

70
65
60
55
50

Write for Bulletin 454 for full information

SEALMASTER'S

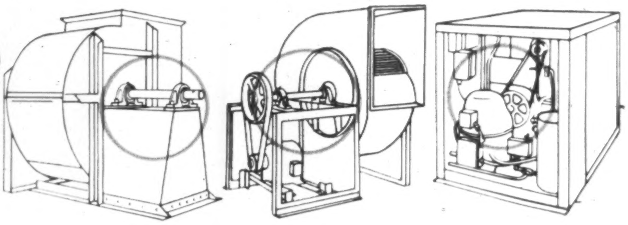
exclusive combination of features assure performance second to none!

There is considerable discussion these days within the air conditioning industry about a universal yardstick for measuring air conditioning output. Regardless of the yardstick arrived at, bearing performance will always have a direct effect on air conditioning efficiency.

An air conditioner may excel in design, construction and workmanship. Yet, failure of a bearing to stand up to the punishing requirements of day after day operation with little or no maintenance can cost your product's reputation. Sacrifice of quality in bearing selection can be a mighty costly market adventure.

SEALMASTER'S exclusive combination of engineering features assure you of the lasting quality you seek. Find out about them today!

SEALMASTER®
BALL BEARING UNITS



SEALMASTER BEARINGS A DIVISION OF STEPHENS-ADAMSON MFG. CO. 47 RIDGEWAY AVENUE, AURORA, ILL.

This is a picture of our product—*CLEAN AIR*

Of course you can't see clean air, and in most cases you can't see dirty air either! But you can easily see the *results* of both . . . and results have made AAF the world's leader in clean air since 1921.

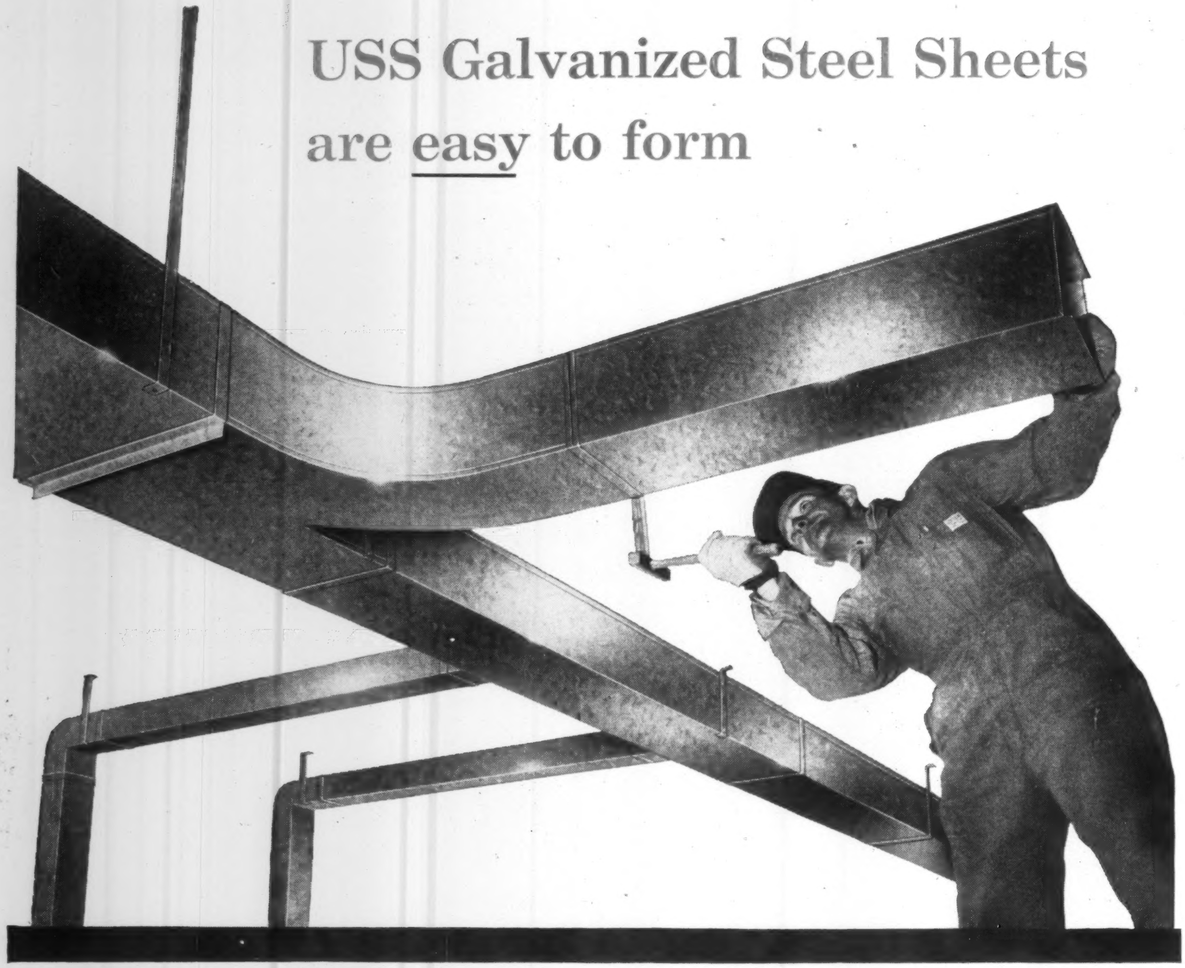
Instead of selling merely one or two kinds of filters, AAF sells *clean air*, and manufactures more than a dozen different types of filters to achieve it. From the complete AAF line, you can select the filter that gives you the *efficiency you need* plus the *maintenance characteristics you want!*

That's why you can be sure that AAF recommendations are made without compromise.

AAF **American Air Filter**
COMPANY, INC.
herman nelson
373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

See AAF Product Advertisement on page 19

USS Galvanized Steel Sheets are easy to form



Whatever type of ductwork you make, USS Galvanized Steel Sheets will prove easy to work with. They are uniform in flatness, softness and surface finish. They can be bent, cut, stamped, rolled, soldered in minimum time with satisfactory results. And their tightly adhering, evenly applied zinc coating is highly resistant to flaking, cracking and chipping under severe forming conditions.

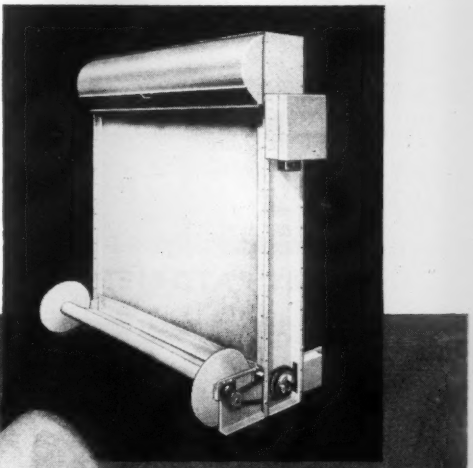
On any job where good-looking, easy-forming galvanized steel sheets would be an asset, ask for USS Galvanized Steel Sheets. For more information, get in touch with the nearest Sales Office of United States Steel.

USS GALVANIZED STEEL SHEETS

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

There's only one Roll-O-MATIC AIR FILTER



...because there's only one Roll-O-MAT MEDIA!

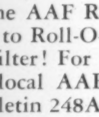
...and the media is the filter!

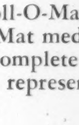
A supposedly "equal" air filter might *look* like the AAF Roll-O-Matic, might conceivably even *operate* like it. But the *dirt-stopping* job is done 100% by the *media, and there's no media anywhere in the world like Roll-O-Mat!*

This fluffy white blanket of bonded glass fibers is the result of dozens of AAF research projects involving radically new methods, completely new materials. Roll-O-Mat compresses to paper-like thinness on the roll and loads into the filter like film in a camera. It's pre-charged with AAF viscosine—an exclusive product specially developed to retain its non-sticky consistency under an extremely wide range of temperature and humidity conditions.

There's no equal to the AAF Roll-O-Matic because there's no equal to Roll-O-Mat media . . . and the media *is* the filter! For complete information, contact your local AAF representative or write direct for Bulletin 248A.

AAF Dust Control
Equipment





Illinois
Heating Specialties

AAF **American Air Filter**
COMPANY, INC.
herman nelson

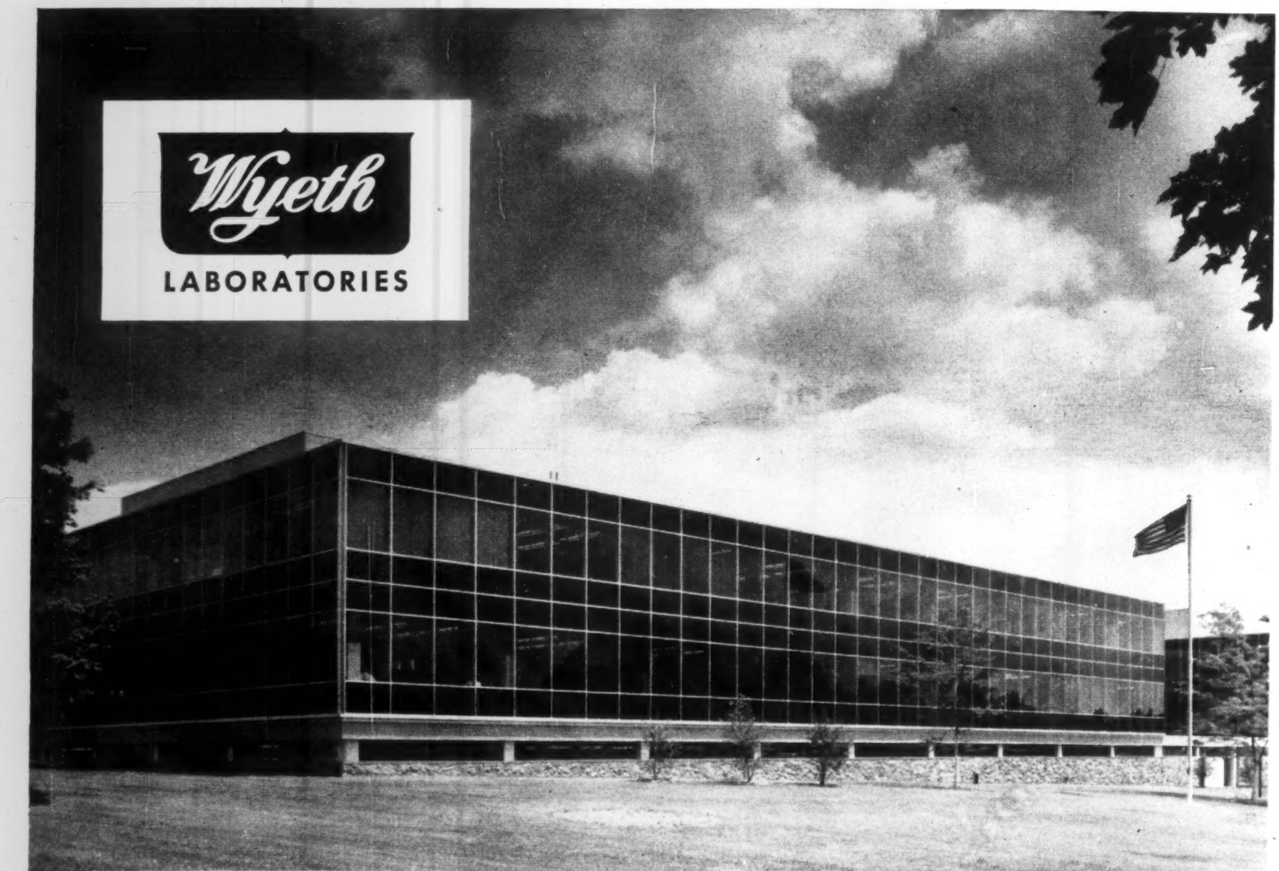
373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P.Q.

—— BETTER AIR IS OUR BUSINESS ——

Herman Nelson
Unit Heaters

Herman Nelson
Unit Ventilators

Wyeth
LABORATORIES

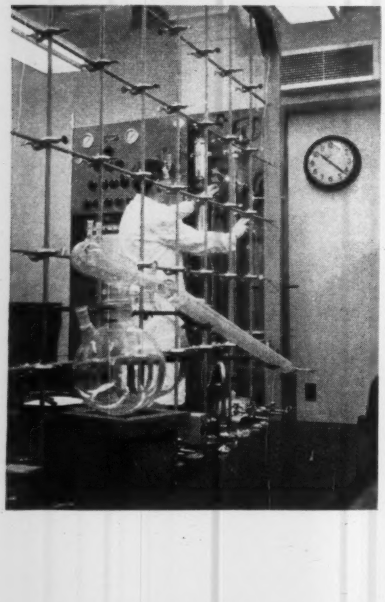


Another of America's Most Modern Buildings . . . controlled by POWERS

Wyeth's New Administrative and Research Center

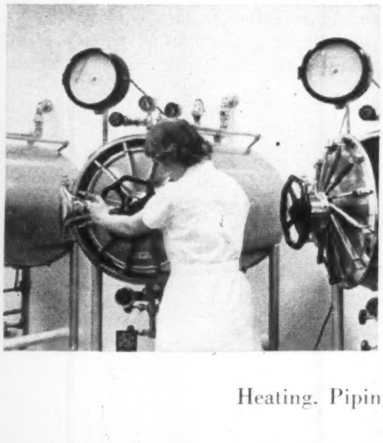
RADNOR, PENNSYLVANIA

Animals, bacteria, microbes and people here, work in spaces regulated by Powers control.



Skidmore, Owings & Merrill, New York, *Architects*
Seelye, Stevenson, Value & Knecht, New York, *Mech. Engineers*
George A. Fuller Co., New York, *General Contractor*
Wm. M. Anderson Co., Philadelphia, *Mech. Contractor*

(c87)

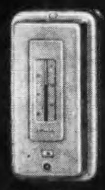


POWERS air conditioning control system

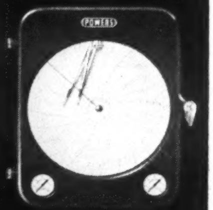
helps provide ideal working comfort

for productive research . . . .

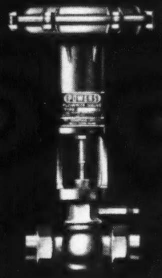
Constant Research and new product development have been the lifeblood of this 96 year old pharmaceutical firm. In ***Wyeth's*** *new headquarters, research workers and administrative personnel work in a modern environment conducive to productive research and efficient solution of management problems.*



Symbol of Economy and Quality Control



Controlling Recorder



FLOWRITE Valve

Powers Precision Control, in the 78 separate self-contained laboratories here, maintains temperature and humidity conditions required for exacting research. Offices, library, cafeteria, conference rooms, lounge and other rooms are provided with Powers zone control for heating and air conditioning systems.

Individual Space Control in the laboratory building enables occupants to dial the temperature they want. Fan systems in the penthouse supply properly conditioned air to the various spaces. For the perimeter areas under-the-window fan type air conditioning units are used and controlled by Powers Heating-Cooling thermostats. For the interior zones fan systems supplying conditioned air are equipped with reheat coils . . . all are Powers controlled.

Heating and Air Conditioning Equipment controlled by Powers: 37 supply fans, 69 reheaters or booster heaters, 58 exhaust fans, 25 fume hood exhaust fans with volume control, and 12 convertors.

Wide Variety of Control Problems in Wyeth's modern building illustrate the versatility of Powers control systems to meet exacting requirements in other types of buildings.

Are You Planning a New Building or modernizing an old one? If so, ask your architect or engineer to include a time-proven Powers Quality system of control. You'll be sure of utmost comfort and lowest operating and upkeep cost.

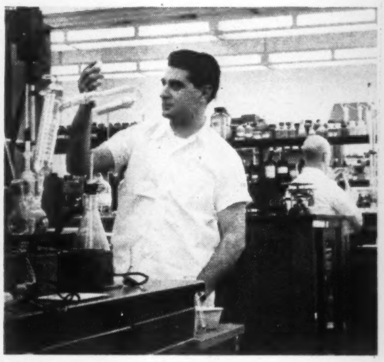
For further information contact our nearest office

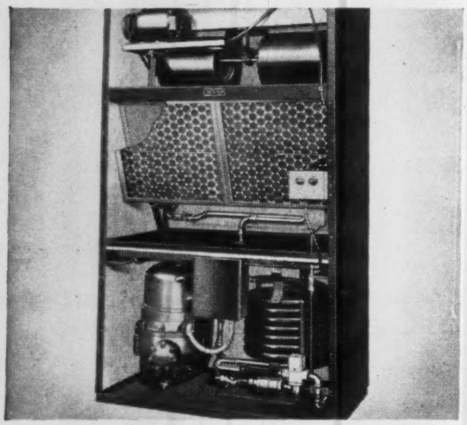
THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*

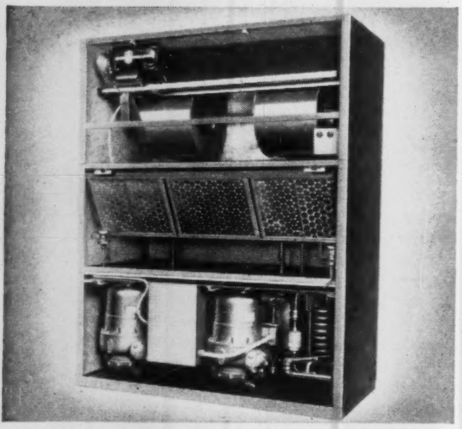
65 Years of Automatic Temperature and Humidity Control

Below: Some of the 19 Special Rooms used for various experiments at constant temperature between 0°C to 5°C also from 20°C to 40°C.





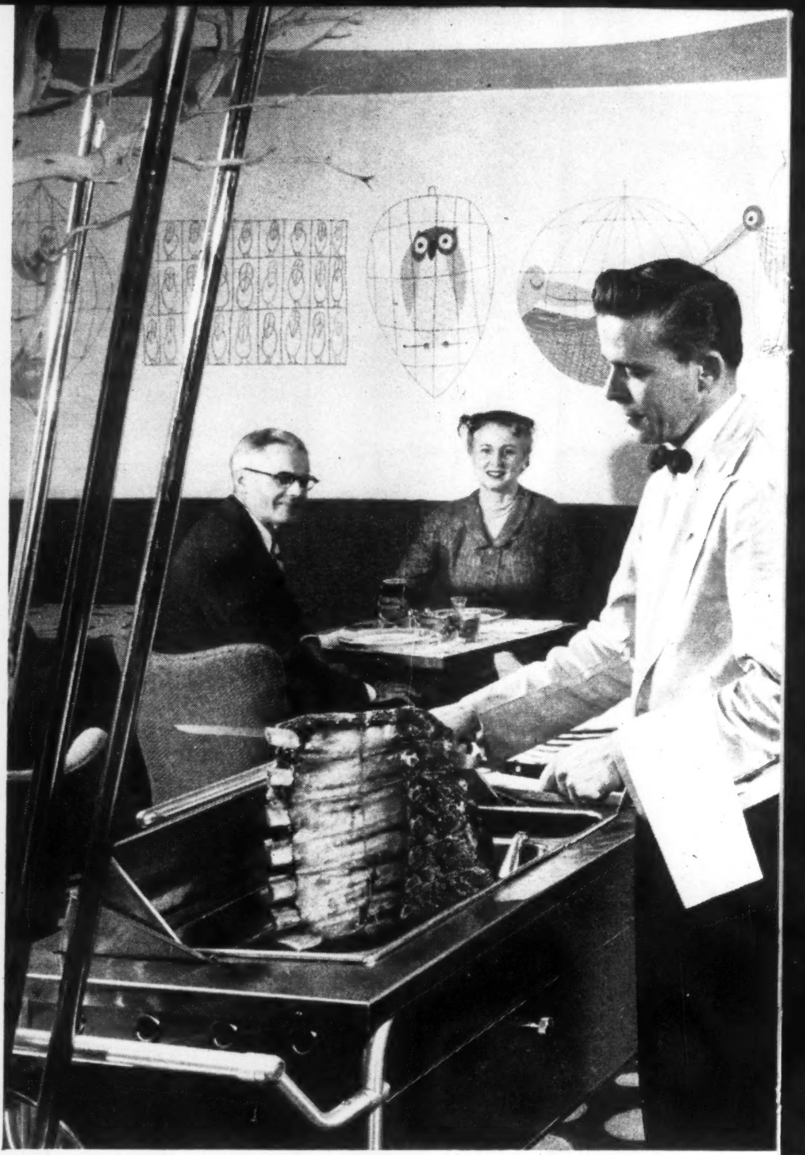
Sound-sealed, compact. Interior view shows full utilization of space which makes TRANE unit so trim. Note, too, how refrigeration equipment is virtually sealed away in its own independent compartment.



TRANE 10 and 15-ton deluxe air conditioners. Note dual refrigeration cycle using hermetic compressors.

Larger sizes, too. 10, 15 and 20-ton models with or without evaporative condensers. Delivered with all internal wiring and piping completed. As their heart, they have TRANE Reciprocating Compressors, famed for long life, easy servicing, with complete interchangeability of parts.

THE TRANE COMPANY, LA CROSSE, WIS. • EASTERN MFG. DIV., SCRANTON, PA.
TRANE COMPANY OF CANADA, LTD., TORONTO • 90 U.S. AND 19 CANADIAN OFFICES



So quiet you

Modern "Iso-Sound" design

Even if you're seated as near a TRANE Self-Contained Air Conditioner as the people in this picture—*you can't hear the compressor cut in!*

It's because TRANE has completely redesigned the usually noisy elements of packaged air conditioners to bring you whisper-quiet operation.

In the mechanical refrigeration section, specially designed parts reduce vibration, minimize noise.

Centrifugal fans are twice tested for quietness. Fan housings are *tight* to prevent noisy air leaks.

With new TRANE "Iso-Sound" design, both fan and compressor sections float independently on sound and vibration isolators. ➸

can't hear it start !

compressor plus exclusive Trane
assures smooth, vibration-free operation!

The result: the smoothest, quietest package unit in TRANE history. One you can confidently specify for clients who want *quiet* as well as *comfort*. And trim, slim beauty in cabinet design, too!

TRANE Self-Contained Air Conditioners are bringing *big system* performance to stores, shops and offices and factories all over the nation.

The complete TRANE line includes package units from 3 to 20 tons—other equipment to 1,500 tons—to handle any size or type of job.

For full data on the TRANE packaged line for 1957, call your nearby TRANE Sales Office or write TRANE, La Crosse, Wisconsin.

For any air condition, turn to

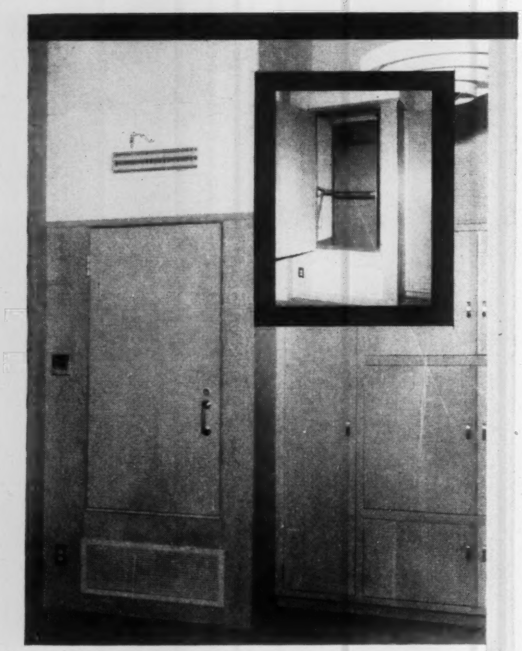
TRANE

MANUFACTURING ENGINEERS OF
HEATING, COOLING, VENTILATING
AND HEAT TRANSFER EQUIPMENT

How Janitrol

MULTIPLE HEATING UNITS

multiply school building and modernization dollars

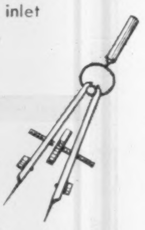


Specifying Janitrol gas-fired warm air individual room units in place of a central system can mean savings up to 50% on original equipment and installation. *More* dollars to spend for other phases of construction or modernization, with assurance that the children and teachers will get top quality heating in classrooms, gymnasium, cafeteria.

The versatility of Janitrol gas-fired units makes them easily adaptable for a wide variety of installations. Units operate only as needed—no wasted heat in unoccupied areas. With a Janitrol "multiple unit" installation, you can provide *zoned comfort* without extra cost . . . insure lifetime heating economy.

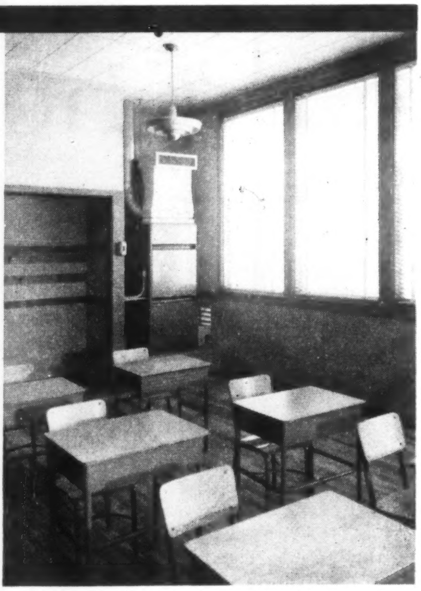
All requirements are met by Janitrol's complete line. Select from models for closet or alcove, for suspension from ceiling, for vertical or horizontal discharge in a wide range of heating capacities. Every Janitrol gas-fired heating unit features the famous Janitrol Multi-Thermex heat exchanger, with a record of less than ¼ of 1% failures for any cause in over two million exchangers. Your reputation is in good hands when you trust it to Janitrol quality and economy.

MOST ECONOMICAL IN OVER NINETY SCHOOLS is the record of this thoroughly modern Janitrol forced warm air heating system designed by Architects Kistner, Wright & Wright, Los Angeles. Each room has a compact, concealed, Janitrol gas-fired winter conditioner in a ventilated closet. Thus each room enjoys individual temperature control, as required by student activities. Two warm air outlets are placed above the woodwork. Air return is below access door. An outside air inlet supplies combustion air.



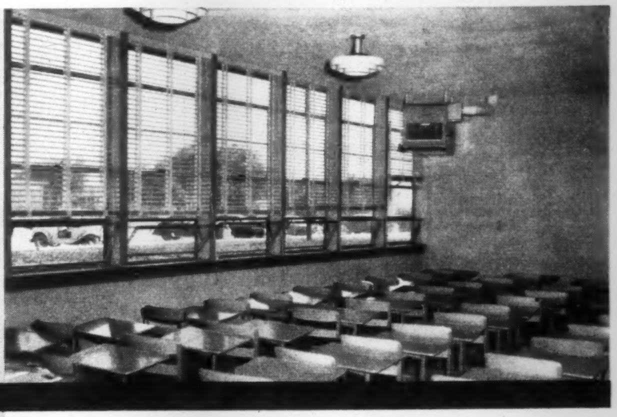
ARCHITECTS' AND ENGINEERS' INFORMATION SERVICE

Write today for complete A.I.A. files on heating with gas in big buildings of every type, and for Janitrol specifications service. There's no obligation.

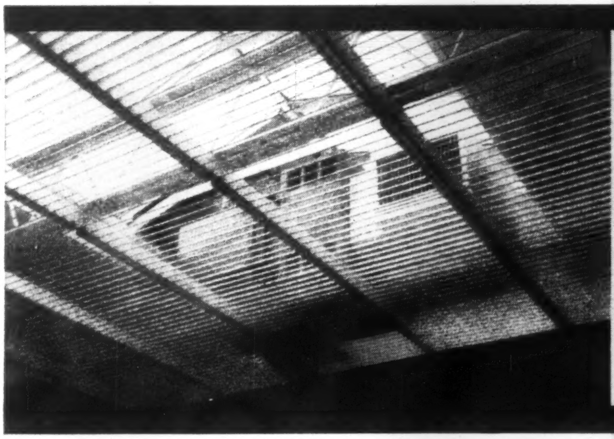


HERE'S A COMPACT, LOW COST INSTALLATION. The Janitrol Winter Conditioner is on a plenum alongside an outside wall and backed up to a partition wall. Warm air is discharged from the top outlet grille across the outside wall and windows. Fresh air and recirculation air enters through the floor plenum. If desired, ducts can be extended through the partition into the adjoining classroom, and both rooms heated by one unit. Installation in Tilley Elementary School, Orange, Texas. Architects, Stone & Pitts, Beaumont.

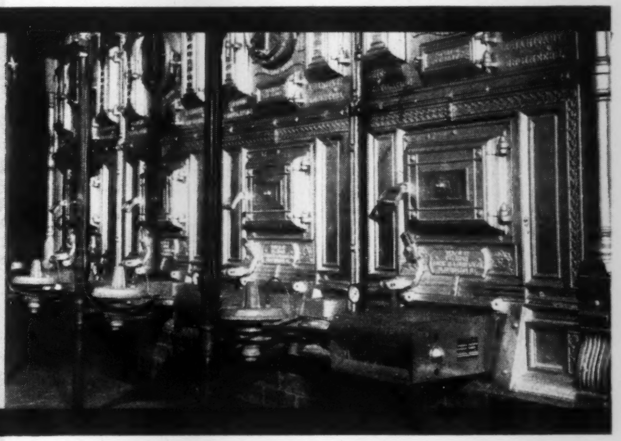
"WE SAVED ENOUGH TO BUILD WITHIN OUR BUDGET BY USING JANITROL GAS UNIT HEATERS INSTEAD OF A CENTRAL SYSTEM", states Mr. James Dawson, Sup't. of Schools, Crawford County, Bourbon, Mo. Each heater is thermostatically controlled. The architectural firm of Barnes and Snipes writes, "The reason for using Janitrol equipment included economy of installation and flexibility of handling the heating problem." Janitrol Gas Unit Heaters are designed for dual fuel operation, save floor space, reduce maintenance costs.



A TYPE OF INSTALLATION FAVORED BY MANY ARCHITECTS incorporates a Janitrol Horizontal Winter Conditioner suspended from the ceiling in each room. Warm air is directed parallel to outside walls and across glass areas. A built-in centrifugal blower provides quiet, even air circulation. This unit is also approved for use with a duct system, and is available in models for 65,000 to 150,000 Btu/hr. inputs. Installation illustrated is at Rosen Heights School, Fort Worth, Texas. Architect is Stanley Brown, Dallas.



LOUVERED CEILING PANELS of the venetian blind type serve a three-fold need at West Columbia School, near Houston, Texas. They conceal the Janitrol blower-type unit heater. They effectively diffuse the heat, preventing it from blasting on the occupants below. They diffuse and distribute light from the sawtooth roof windows. This type of application is recommended for areas where "cold floor" problems are not encountered. Architect: Donald Barthelane, Houston, Texas. Contractor: The Warren Co., Houston.



MANY SCHOOL-HOUSE TYPE FURNACES HAVE BEEN CONVERTED FROM COAL TO CLEAN, EFFICIENT GAS by installation of Janitrol SC-05 large capacity burners, which are designed for input capacities up to 750,000 Btu/hr. each. The Janitrol SC-05 Conversion Burner fits furnaces or boilers with an ashpit opening not less than 15⅛" wide by 7-5/32" high and in which the depth of the burner throat does not exceed 4". Shown here: Installation at Bridgeport High School, Bridgeport, W. Va.

®Janitrol

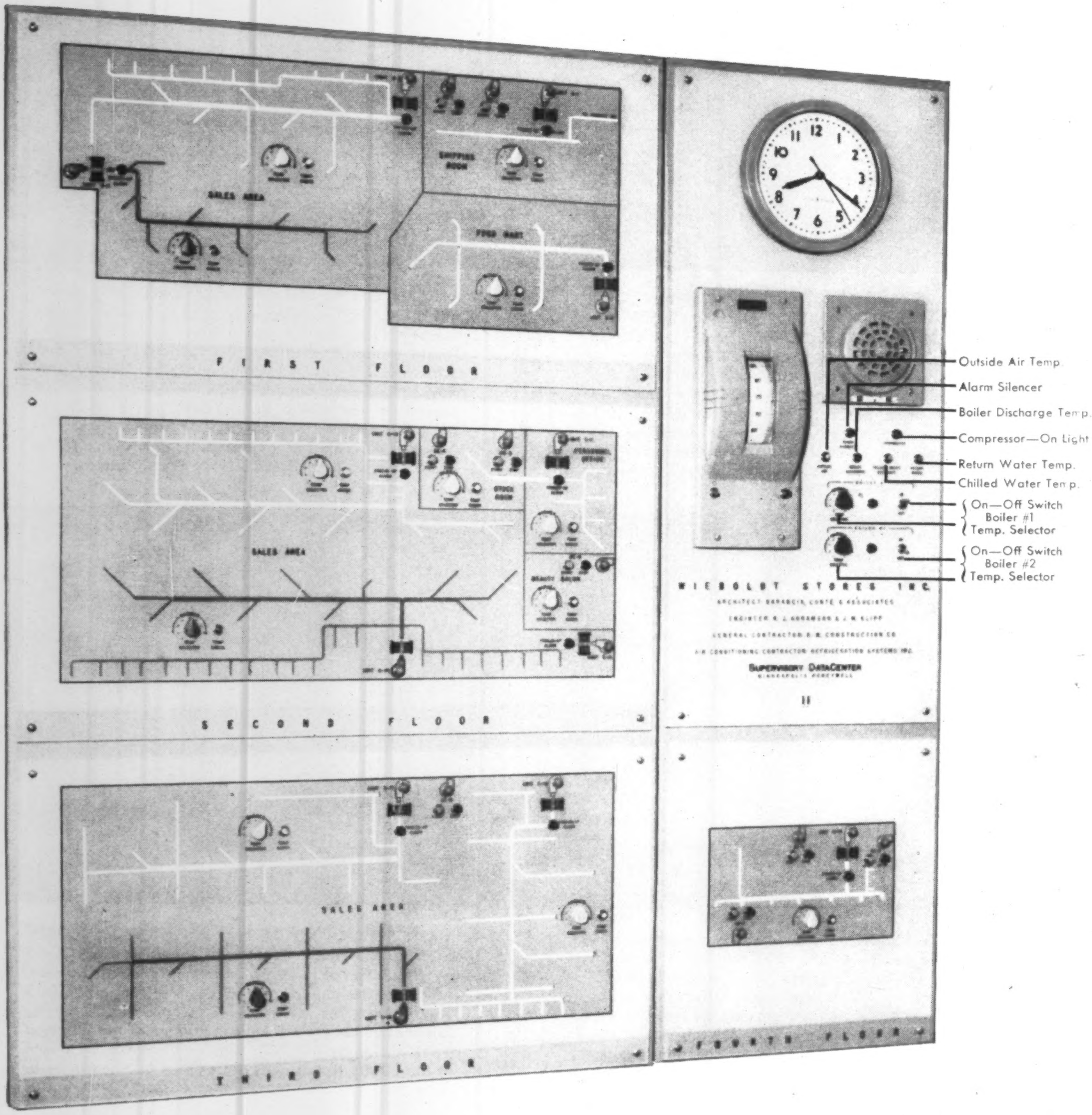
JANITROL HEATING & AIR CONDITIONING DIVISION
SURFACE COMBUSTION CORPORATION
COLUMBUS 16, OHIO
IN CANADA: MOFFAT HEATING & AIR CONDITIONING DIVISION
MOFFATS, LTD., TORONTO 15

Also Makers of *Surface* Industrial Furnaces, *Kathabar* Humidity Conditioning, *Janitrol* Residential Heating and Cooling Equipment.

winter conditioners adaptable for summer cooling

. . . with installation of Janitrol's new air-cooled cooling system that uses no water, eliminates water service and maintenance costs. May be installed concurrently with winter conditioner, or any time later, without additional duct work.

Control leadership through advanced engineering-research

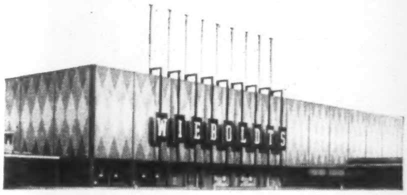


SALES AREA
SHIPPING ROOM
FOOD MART
FIRST FLOOR
STOCK ROOM
PERSONNEL OFFICE
SALES AREA
BEAUTY SALON
SECOND FLOOR
SALES AREA
THIRD FLOOR
FOURTH FLOOR
WIEBOLDT STORES INC.
SUPERVISORY DATACENTER
Outside Air Temp.
Alarm Silencer
Boiler Discharge Temp.
Compressor—On Light
Return Water Temp.
Chilled Water Temp.
On—Off Switch
Boiler #1
Temp. Selector
On—Off Switch
Boiler #2
Temp. Selector

How panel works. Comfort zones are displayed on floor plans, as photo above shows. Each zone has its own adjustment knob, which changes the control point of the thermostat located in the zone; each zone also has its own temperature check button. Pressing button causes the temperature to be indicated on the precision instrument beneath the clock. Operating controls for the basic heating and air conditioning system are located to right of indicator. Alarm directly beneath clock warns against danger of coil freeze-up by sound and flashing light.

For heating and cooling

Automation through Centralization—with Honeywell Supervisory DataCenter*



Architect: Barancik, Conte & Associates.
Engineer: R. J. Abramson & J. M. Klipp.
General Contractor: B-W Construction Co.
Air Conditioning Contractor: Refrigeration Systems Inc.

With your clients in mind, consider the Honeywell Supervisory DataCenter in the new Wieboldt store, Harlem-Irving Plaza shopping center, Norridge, Illinois.

It's a good example of how the DataCenter makes it easy for the store manager or the maintenance superintendent to understand and effectively operate the air conditioning system. Controls that were before scattered throughout a building are now centralized and made easy to understand and operate—bringing the benefits of automation of heating and cooling to your clients.

From this one location near the 4th floor penthouse, the manager can read and correct immediately temperatures in any of the building's 13 comfort zones.

Furthermore, operation of the entire hot and chilled water system can be checked, at the panel, any hour of the day or night. An easily-read Honeywell instrument indicates all temperature readings—including boiler discharge and return, chilled water discharge and outside air.

And with your clients in mind what does this add up to? Greater operating efficiency with less personnel time and without specialized manpower . . . longer equipment life . . . operational savings that liquidate cost . . . attractive display of your engineering design . . . and above all, a more comfortable store.

More than 100 of these installations are now in operation throughout the country. All components of the DataCenter are manufactured by Honeywell. And *only* Honeywell manufactures pneumatic, electric and electronic controls and instruments.

For further information about the DataCenter and other Honeywell control concepts, call your local Honeywell office. Or write to Minneapolis-Honeywell, Dept. HA-5-177, Minneapolis 8, Minnesota.

For news about other major Honeywell contributions to indoor climate, turn the page . . . →

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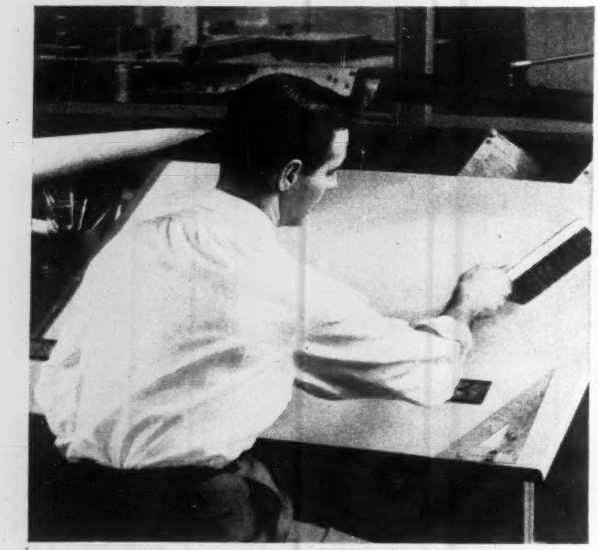
*Trademark

Who said dirt cheap?



Save your client clean-up money

Help him cut lost man hours

*New Honeywell Electronic Air Cleaner removes 6 times more costly dirt than mechanical filters**

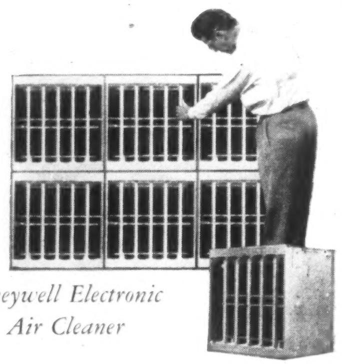
Most soiling of your client's work surfaces, walls, fixtures and merchandise is done by air-borne particles less than 1/25,000 of an inch in size.

Particles much smaller than these—including the bacteria and viruses that cause many respiratory ills—can be removed by Honeywell's new Electronic Air Cleaner.

It is an impossible job for the mechanical type filter to remove oil smoke, fumes, tobacco smoke and much of the dust and fly ash that fall into this microscopic class of contaminants. And these are the ones with the greatest staining power.

The new Honeywell Air Cleaner's wide range of protection offers a scientific way to cut the high costs of cleaning, soiled merchandise, mechanical failures and absenteeism by trapping air-borne dirt *before* it has a chance to steal your client's profits.

Whatever business he's in, he will find the many advantages of a Honeywell Electronic Air Cleaner more than pay for its installation. For details call your local Honeywell office or write Minneapolis-Honeywell, Dept. HA-5-177, Minneapolis 8, Minnesota



Honeywell Electronic Air Cleaner

To aid the engineer—Honeywell makes a complete range of Electronic Air Cleaners for any type of air conditioning or ventilating system. Number of cells is determined by amount of air handled by the system. *Module construction* makes installing and servicing easy. Sales and service aid available in 112 Honeywell offices across the nation.

Honeywell

H HONEYWELL First in Controls

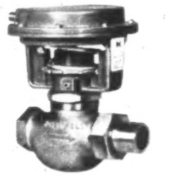
---

* *According to the National Bureau of Standards tests, electronic air cleaners remove at least 90% of the dirt particles causing the greatest staining, while ordinary mechanical filters remove only about 15%.*

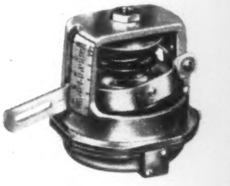
Use the Honeywell unit ventilator team

3 controls designed to work together for one purpose only—better unit ventilator performance

L0907 Air Stream Thermostat. Fits any ventilator end compartment, has fast response and fewer moving parts. Exclusive snubber action gives unequalled stability. Thus, when occupancy in room reduces the heating load or when fresh air controlling is called for, the L0907, working with the room thermostat, resets the air temperature delivered by the unit ventilator to exactly balance heating or cooling demands of the room.



V0512A Valve. Gives balanced modulation of steam flow. High temperature rolling diaphragm combined with low-friction Teflon cone packing gives improved modulation, eliminates jerky step-by-step action and gives smooth positioning. Slightest signal from the thermostat will reposition the valve. Exclusive "equal percentage" valve plug means one valve gives small valve performance on light loads and large valve capacities on heavy loads. On light loads a change in valve position produces a slight change in heat delivered—at heavy loads the same change in position produces a very sizeable change in heat delivered.



M0516 Damper Motor. Rolling diaphragm here reduces friction and, as a result, gives more precise positioning. Diaphragm prevents sticking, thus adds to modulated action of the Honeywell control team. Very small, compact unit fits any unit ventilator, yet is amply powered to move the damper.

And 1 thermostat that has no equal

Honeywell Pneumatic Round—T0910A. Low mass bi-metal gives fast response to temperature changes. Force-balance feedback principle gives linear response of the control air pressure to changes in room temperature under all conditions. Thus, proportionate amounts of heat are delivered into the room—in balance with change in the thermostat. Modern in design and appearance, it is easy to calibrate and adjust. Equipped with plug-in gage connection for ease of calibration. Comes in many models, including day-night fan cycle control.

Honeywell's unit ventilator control team eliminates hot and cold blasts, gives even, modulated air flow

This Honeywell control team of room thermostat, air stream thermostat, valve and damper motor exclusively developed for unit ventilators, levels out the peaks and valleys of heat and cold, troubles all too familiar in the nation's schools.

What's more, the air temperature delivered by the ventilator changes only as a result of a change in room temperature. Cycles of hot to cold are sensed by the air stream thermostat and corrected before they start.

Honeywell unit ventilator controls are backed by a service organization that is immediately available, in 112 offices, nation-wide.

For full information, call your local Honeywell office. Or write Minneapolis-Honeywell, Dept. HA-5-177, Minneapolis 8, Minnesota.

Honeywell

H First in Controls

Only Honeywell gives you all four—pneumatic, electric, electronic, instruments.

Carrier Hermetic Centrifugal Refrigerating Machines:

now in a complete range of sizes

100 to 1000 tons

Carrier has now boosted the capacities of its 19C Centrifugal Refrigerating Machines to meet large-scale refrigerating requirements...up to 1000 tons.

Outstanding success with units up to 400 tons capacity brought immediate demand for the same features in units of larger capacities. Now even in your big jobs you get these advantages:

It combines weight savings, space savings and efficiency better than ever before achieved in a large refrigerating machine.

It runs smoothly and quietly; you can locate it on top of a building, or in the basement without a heavy or costly foundation.

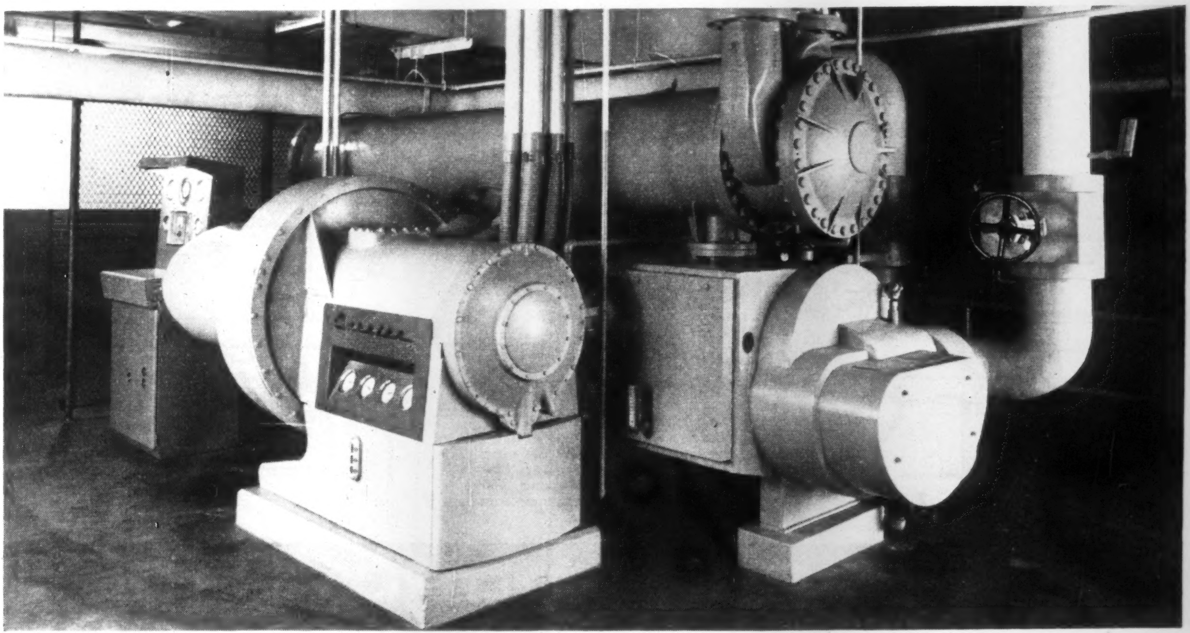
It operates economically. Capacity and power are adjusted to the load, continuously, by inlet capacity vanes that are positioned, as required, by the hydraulic pressure of the lubricating oil—a Carrier exclusive.

It is automatic. After simple push-button starting, electronic controls provide continuous, automatic chilling of water to the desired temperature.

It has mechanical simplicity. The motor-compressor unit, hermetically sealed against air, moisture and refrigerant loss, is factory assembled on a single shaft. There is no problem of field alignment.

air conditioning • refrigeration • industrial heating **Carrier**

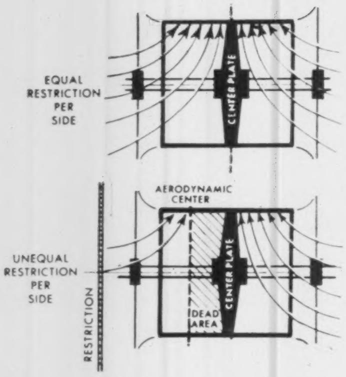
Free booklets tell you more about this hermetic centrifugal. Carrier Refrigerating Machines can be the heart of any air conditioning system. Call the Carrier office nearest you. Or write to us at Carrier Corporation, Syracuse, New York.



7 WAYS

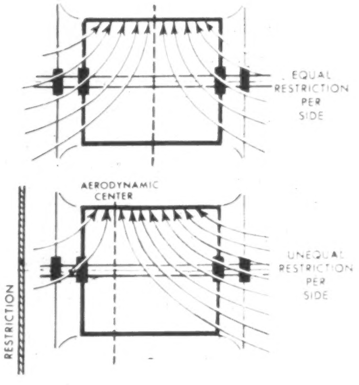
MORRISON

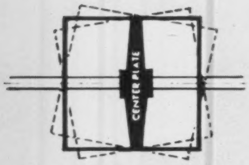
END SUPPORTED WHEEL


EQUAL RESTRICTION PER SIDE
CENTER PLATE
AERODYNAMIC CENTER
UNEQUAL RESTRICTION PER SIDE
RESTRICTION
DEAD AREA

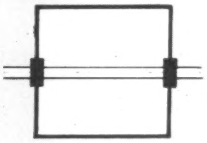
1 MAXIMUM UTILIZATION WITH END SUPPORTED WHEEL

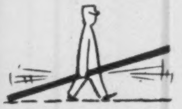
When inlet conditions are unrestricted, the aerodynamic center is in the exact geometric center in both Morrison End Supported wheels and center plate wheels. BUT — when one inlet of the blower is more restricted than the other, the aerodynamic center in a Morrison End Supported wheel, moves toward the restricted side permitting greater utilization of the unrestricted side as illustrated. In a center supported wheel, the restricted side of the blower is starved and the unrestricted side is unable to compensate for it.


EQUAL RESTRICTION PER SIDE
AERODYNAMIC CENTER
UNEQUAL RESTRICTION PER SIDE
RESTRICTION

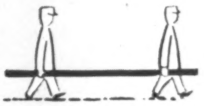

CENTER PLATE

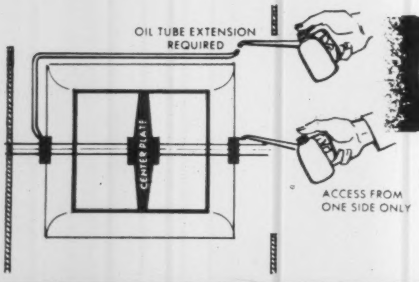
2 STABLE SUPPORT WITH END SUPPORTED WHEEL





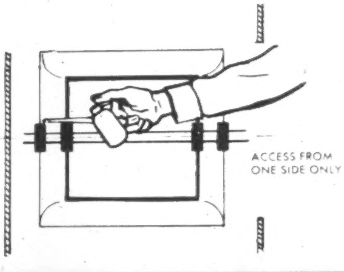
Morrison End Supported Wheels are mounted stably on the shaft, eliminating rocking action that causes wheel wobble.




OIL TUBE EXTENSION REQUIRED
CENTER PLATE
ACCESS FROM ONE SIDE ONLY

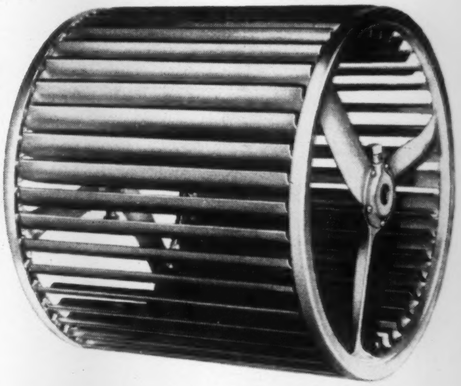
3 EASY MAINTENANCE WITH END SUPPORTED WHEEL

With Morrison End Supported Wheel, oiling is easy. You oil one end — and as the drawing shows — reach through the wheel to oil the other end. No complicated tube extension is necessary.

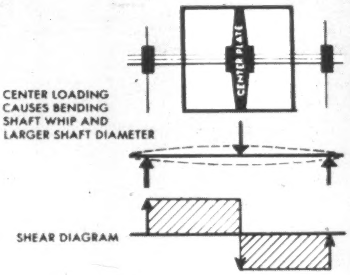

ACCESS FROM ONE SIDE ONLY

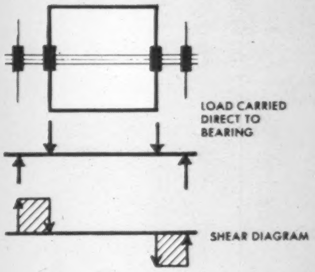
MORRISON PRODUCTS, INC.

BETTER!



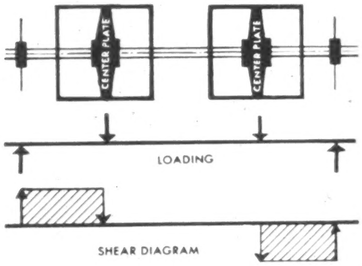
4 MINIMUM SHAFT LOADING WITH END SUPPORTED WHEEL

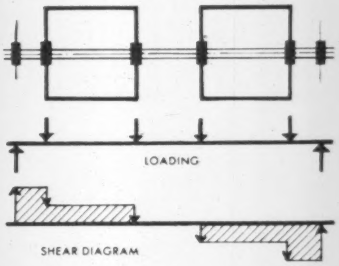

CENTER PLATE
CENTER LOADING CAUSES BENDING SHAFT WHIP AND LARGER SHAFT DIAMETER
SHEAR DIAGRAM


LOAD CARRIED DIRECT TO BEARING
SHEAR DIAGRAM

Morrison End Supported Wheel relieves strain as load is carried directly to bearings. There is no shaft whip. Center Plate Wheels put added strain on the shaft, causing bending, shaft whip and require larger shafting.

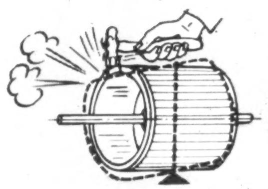
5 UNIFORM DISTRIBUTION (for Twin Blowers) WITH END SUPPORTED WHEEL

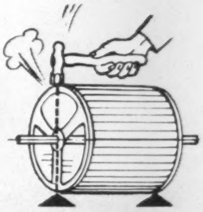

CENTER PLATE
CENTER PLATE
LOADING
SHEAR DIAGRAM


LOADING
SHEAR DIAGRAM

Uniform distribution of load allows using smaller shafting. Heavy concentrated load causes shaft whip and larger shafting.

6 STRONGER FRAME WITH END SUPPORTED WHEEL



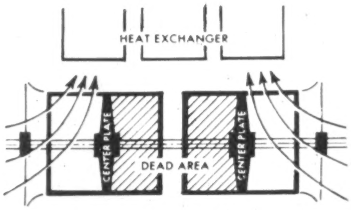


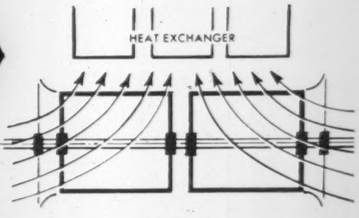
In the case of Morrison End Supported wheel, impact on the end of the wheel is directly supported by sturdy end rings.

Impact on end of center plate wheel lacks sturdiness and distortion results.

Aids safe shipment.

7 EXTRA WHEEL ADVANTAGES WITH END SUPPORTED WHEEL


HEAT EXCHANGER
CENTER PLATE
DEAD AREA
CENTER PLATE


HEAT EXCHANGER

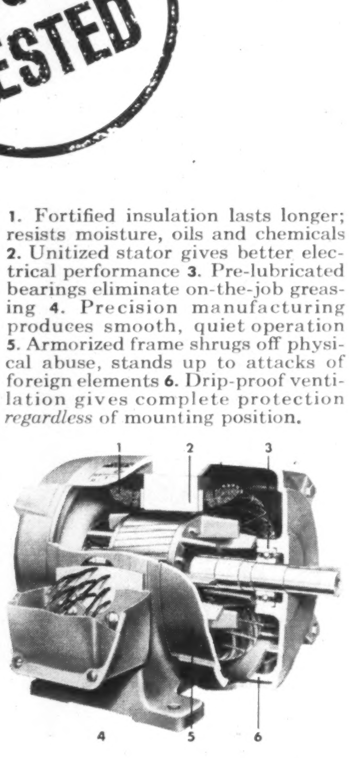
In special applications of two wheels for wide air distribution, the attached drawing shows plainly the greater distribution of air possible with the End Supported Wheel.

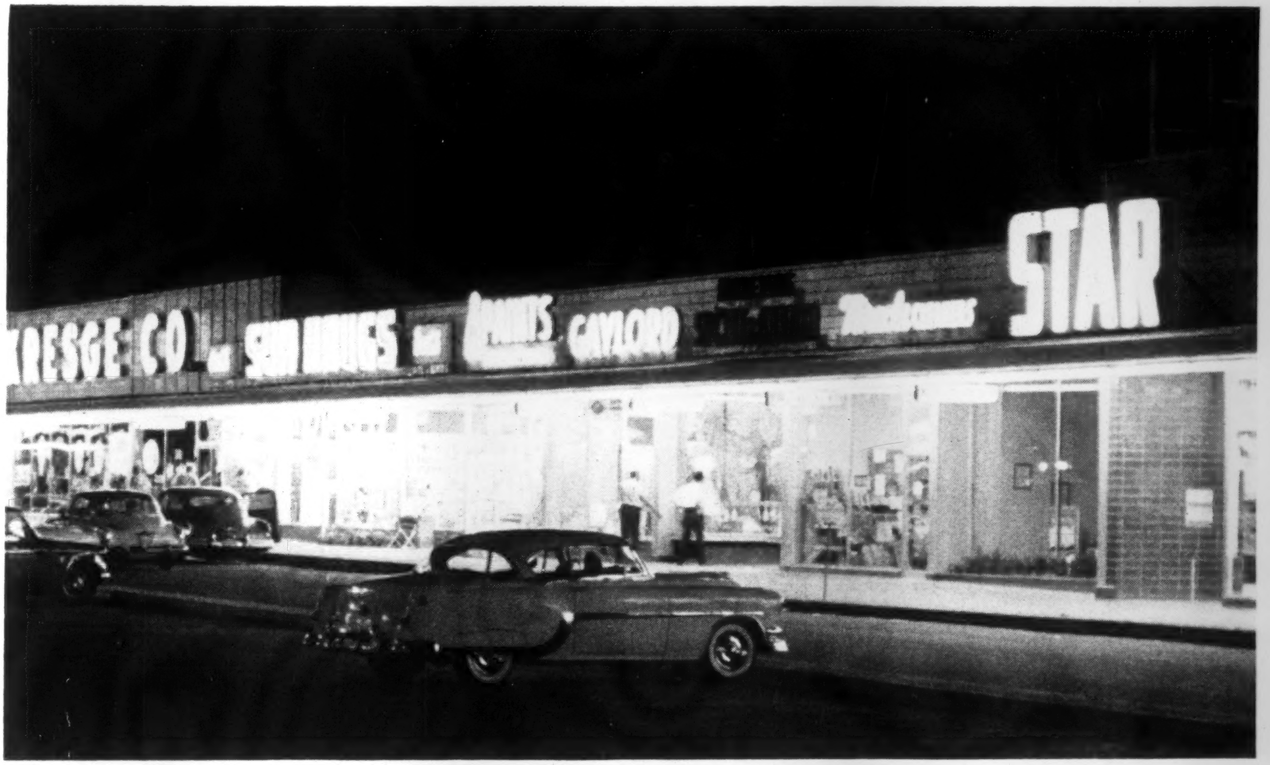
16816 Waterloo Road • Cleveland 10, Ohio

FALLER FURNITURE

JOB TESTED

1. Fortified insulation lasts longer; resists moisture, oils and chemicals **2.** Unitized stator gives better electrical performance **3.** Pre-lubricated bearings eliminate on-the-job greasing **4.** Precision manufacturing produces smooth, quiet operation **5.** Armorized frame shrugs off physical abuse, stands up to attacks of foreign elements **6.** Drip-proof ventilation gives complete protection *regardless* of mounting position.





Westinghouse Life-Line A motors customer approved for air conditioning

Westinghouse Life-Line® "A" motors have been thoroughly tested in tough air conditioning jobs throughout the country . . . and proved *outstanding* for rugged performance, dependability and extremely quiet operation.

Precision manufacturing and dynamic balancing of this Westinghouse motor have produced the quietest operating unit available. Tests in soundproof laboratories prove this Life-Line "A" motor produces an operating sound level lower than other standard motors.

Armorized frame provides rigidity to prevent armature misalignment even with heavy shaft loads . . . protects motor from physical abuse and contamination. Ventilation openings in the end brackets make the Westinghouse motor *completely* drip-proof, regardless of mounting position. Life-Line "A" 4-way sealed, prelubricated bearings keep grease in . . . dirt and water out . . . eliminate on-the-job greasing in out-of-the-way applications.

For complete information, call your local Westinghouse distributor or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-22004

YOU CAN BE SURE...IF IT'S Westinghouse

NEW NEW & NEW EQUAL NEWS

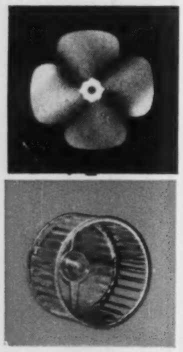
It's the *new* Torrington line of Vari-Basic blower units for central heating and air conditioning equipment, now in production at all three Torrington plants. And here is why this important product development is *news.*

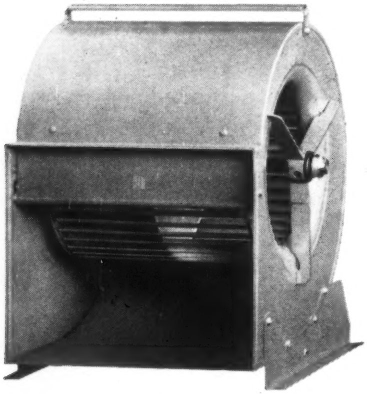
1. New quality: Engineering features include the famous Center-Lock Airotor wheel design . . . permanently plastic lubricated Randall bearings, with 3-point suspension . . . and spot-welded heavy steel construction, superbly finished.

2. New flexibility: The units are designed for interchangeability with existing standard equipment, and Torrington's marketing policy makes these components available singly or in combination.

3. New versatility: These units are available in a wide range of sizes designed to provide maximum variability to meet directional-flow requirements.

Your inquiries are invited. For full information, *talk to Torrington!*





THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT • VAN NUYS, CALIFORNIA • OAKVILLE, ONTARIO

A NEW APPLICATION GUIDE

by Century

to help you select Electric Motors

Century
Performance Rated
MOTORS
GENERATORS
Complete Line 1/20 to 400 hp.
C
CENTURY ELECTRIC COMPANY
1806 Pine Street
St. Louis 3, Missouri
C

This handy Guide is carefully planned to make it easy for you to select electric motors for all popular applications. Using the convenient tables inside, you simply start with the equipment or machinery you want to drive.

Then, you identify the character of the load, starting and running torques, frame type, speed, etc., to arrive at precisely the right motor for your specific application. In just a few moments you know the motor type you need, the dimensions and other pertinent data.

Because Century offers a complete line, this handy manual will guide you to the right motor for your application. Obtain your own copy of this 12-page reference manual.

MAIL COUPON TODAY FOR YOUR FREE COPY →

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Please send me the new Century Application Guide CE-99.

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Company..

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City..*Zone*........*State*........................

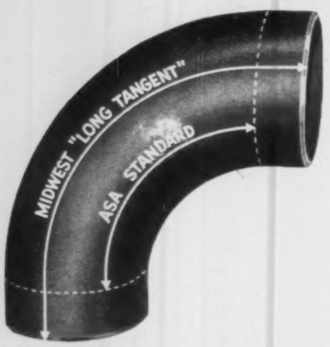
99

Performance-Rated© MOTORS 1/20 to 400 HP

C CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Mo. • ***Offices and Stock Points in Principal Cities***

THESE MIDWEST "LONG TANGENT" ELBOWS SAVED $4121 IN PIPE



MIDWEST "LONG TANGENT" ELBOWS COST NO MORE THAN OTHER ELBOWS

Here are 1227 Midwest "Long Tangent" Elbows (12", 14" and 16" standard weight) ready for shipment to a chemical plant. Each Midwest "Long Tangent" Elbow has a straight section on each end equal in length to ¼ the nominal pipe size. Thus a 12" elbow saves 6" of 12" pipe while a 16" elbow saves 8" of 16" pipe. It doesn't take long to save a lot of pipe and a lot of money . . . in this instance $4121.

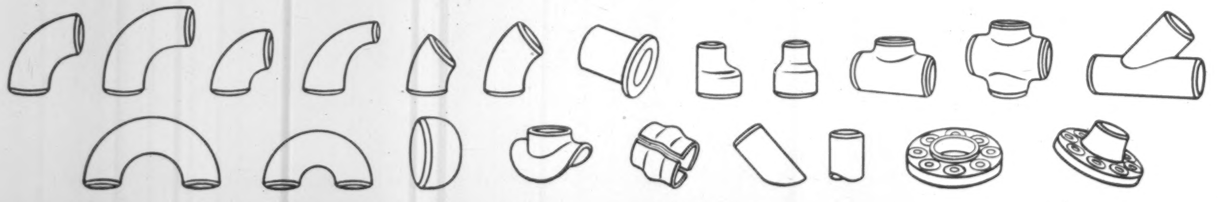
But saving pipe is not the only advantage of Midwest "Long Tangent" Elbows. They often eliminate short nipples and their extra welds . . . save time and money in lining up and clamping pipe and fittings . . . slip-on flanges are more easily applied. For all the facts, write for Catalog 54.

MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Clifton, N.J. and Los Angeles

Sales Offices
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Boston 27—426 First St. • Los Angeles 33—520 Anderson St.
Houston 2—1213 Capitol Ave. • Tulsa 3—224 Wright Bldg.
Cleveland 14—616 St. Clair Ave. • Miami 34—2103 Le Jeune Rd.
San Francisco 11—420 Market St. • Oneida, N. Y.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST WELDING FITTINGS

MIDWEST WELDING FITTINGS Improve Piping Design and Reduce Costs



7055

Want *your* installations to start a "Chain Reaction"?

That's what happened when this man installed PLIOTRON filters in one of the New York hotels. The new filters did such an efficient, money-saving job that the hotel owners soon ordered them for the nine other hostelries in their chain.

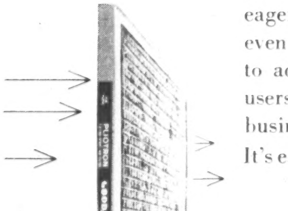
That sort of "chain reaction"—from PLIOTRON installations, large and small—is not unusual. Maintenance supervisors of multiple buildings eagerly standardize on standout items. And even one-shop and one-home owners are quick to advertise their satisfaction to fellow filter-users. In any case, you're in line for extra business.

It's easy to see why. Putting in PLIOTRON, means putting in extra-efficiency, electrostatic filters that attract and then trap as much as *5 times* the fine dirt particles as captured by ordinary types. For it's not a surface-loader—but a depth-loader. It stays on the job far longer between cleanings. Even then, a quick bath puts it back at full filter-power.

It's no mystery, then, why filter-users are willing to pay a little higher—in initial cost—for money savers like these. Or why most every PLIOTRON super-filter installation leads to more installations—and profits—for you. For the complete story, write:

Goodyear, P. O. Box 288, Akron, Ohio.

Pliotron—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

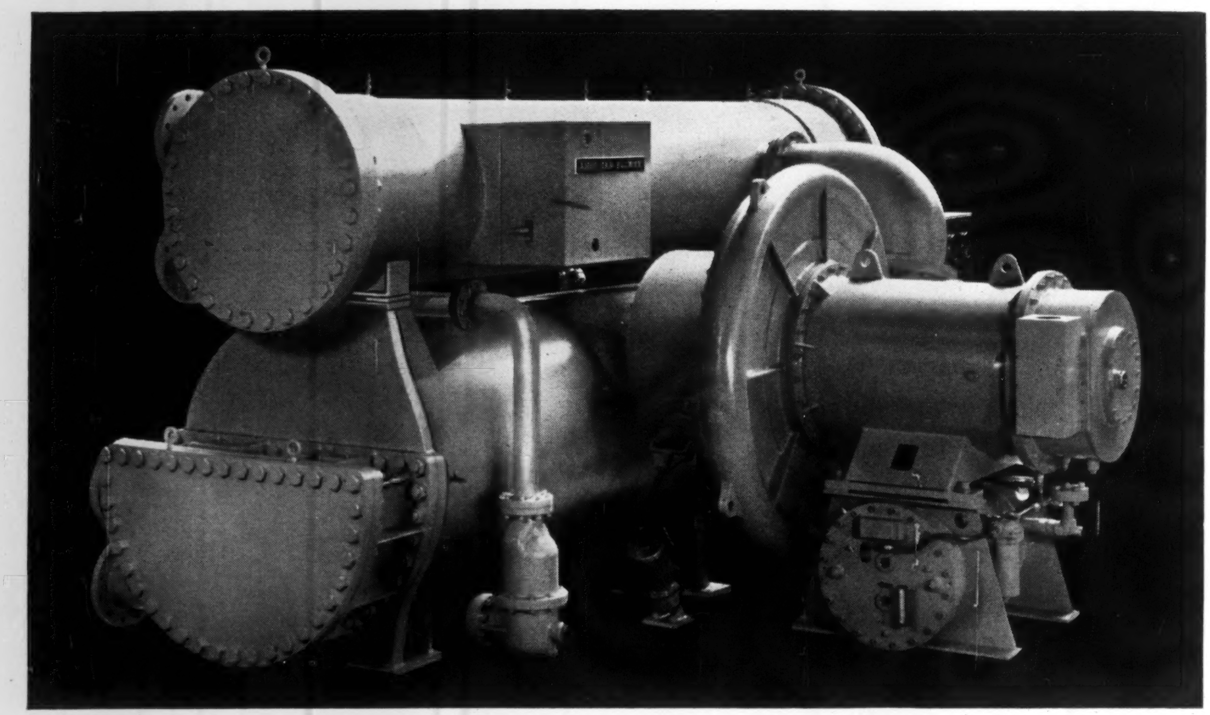


for cleaner air everywhere-

PLIOTRON AIR FILTER BY

GOODYEAR

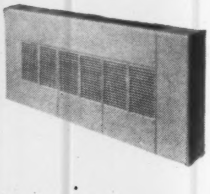
THE GREATEST NAME IN RUBBER



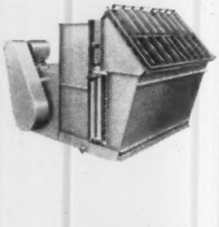
Tonrac® — single-stage hermetic centrifugal refrigerating machine — maintains chilled-water temperature *regardless of load*. Single-level construction simplifies installation.

You'll get one-source responsibility from American Blower's complete air-conditioning line

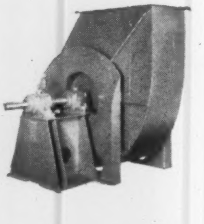
Compact and easily accessible, American Blower Inductor Units are available for both high- and low-pressure systems.



American Blower line includes Multi-Zone Conditioners, plus central-station units and self-contained packaged air conditioners.



Sirocco® High-Pressure Fans are part of the complete American Blower package for high-velocity, high-pressure air-handling systems.



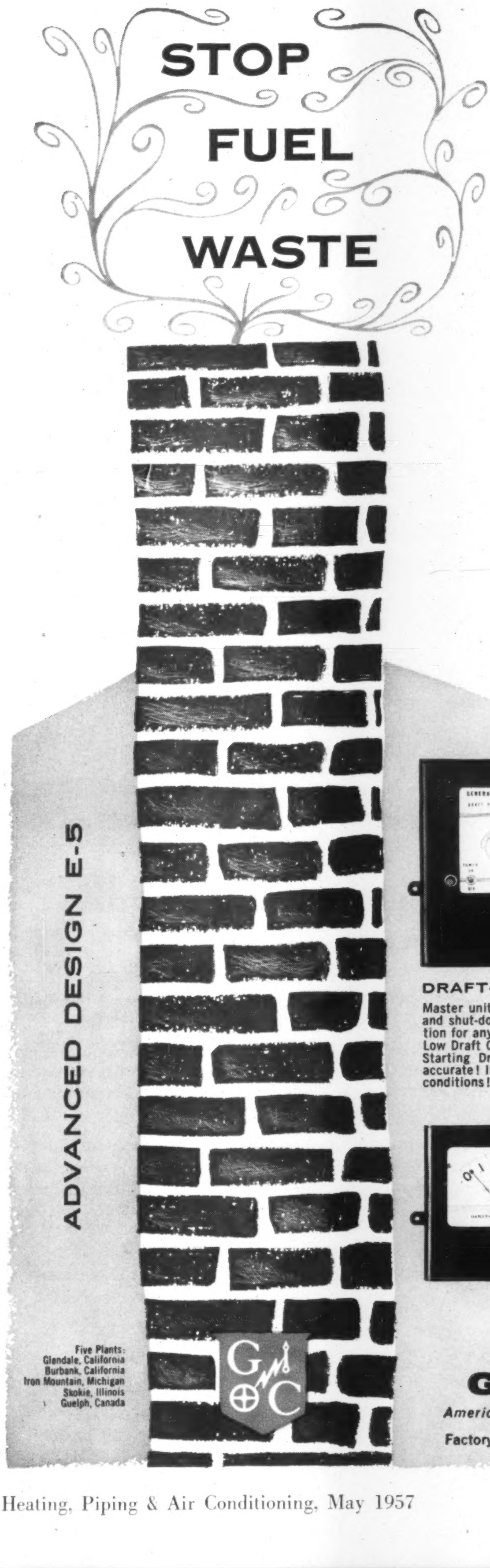
American Blower offers a complete line of air-conditioning products which are designed, engineered, and manufactured to work together. Whether it's for a small installation or a large-scale central or zone system, you can specify *all* your equipment from a single source — pinpoint responsibility for quality, performance, delivery dates. You'll save time and money doing it — and you're assured of a balanced system!

Point is, for every air-conditioning and air-handling requirement, there's an efficient, dependable product backed by American Blower's 75 years' experience. From self-contained packaged units and heating and cooling coils to Tonrac Centrifugal Refrigerating Machines, you get the finest when you specify American Blower. Why not get in touch with our nearest branch today! American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.

AMERICAN BLOWER

Division of American-Standard

American-Standard Products



...YOU SAVE DOLLARS WHEN YOU INSTALL GENERAL CONTROLS DRAFT CONTROL SYSTEMS!

You stop fuel waste when you install the new General Controls E-5 Draft Control System. You save money with any type boiler . . . any type fuel!

Besides fuel savings up to 25% . . . automatic draft regulation helps you save manpower as well. Even in a one-man boiler room the savings can exceed a thousand dollars in one year! Another benefit: in addition to *money savings* you'll *increase good will by adequate smoke control.*

Ask the General Controls Factory Representative in your area to show you how draft regulation will benefit your installation. Call him in soon.

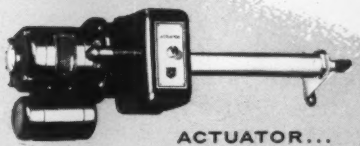
THIS IS THE GENERAL CONTROLS DRAFT REGULATION SYSTEM...

ADVANCED DESIGN E-5

GENERAL CONTROLS
DRAFT PROGRAM CONTROL

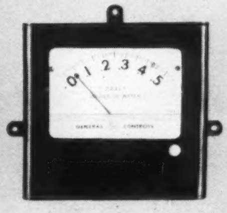
DRAFT-PROGRAM CONTROL...

Master unit programs damper action for start-up and shut-down, plus setting correct damper position for any firing rate. Optionally, it will provide Low Draft Cut-off, Time Delay Cut-off, Adjustable Starting Draft . . . it not only acts fast . . . it's accurate! It even senses changes in atmospheric conditions!



ACTUATOR...

Responding to the commands of the Draft-Program Control, this unit positions uptake damper. Maintains correct draft conditions continuously without attention.

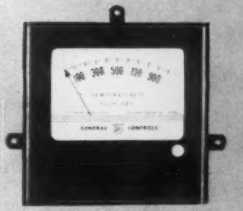


DRAFT GAGE...

Instrument gives continuous visual reading of draft conditions. Operator always knows what is going on . . . no guesswork!

TEMPERATURE GAGE...

Flue gas pyrometer instrument shows efficiency of boiler . . . warns operator of wasteful firebox conditions!



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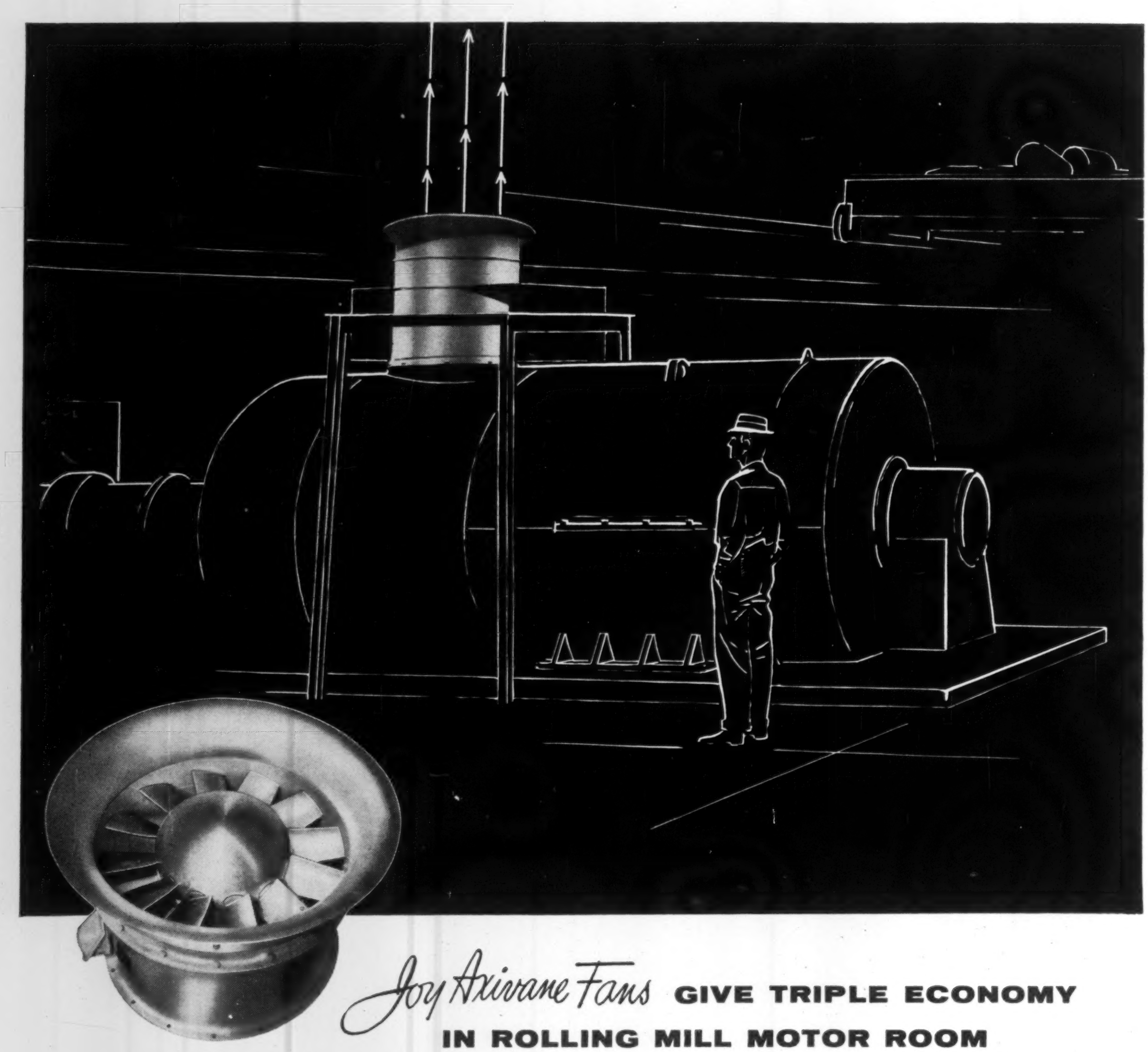
America's Finest Automatic Controls for Home, Industry, and the Military

Factory Branch Offices Serving *All* Principal Cities of the United States and Canada



Joy Axivane Fans GIVE TRIPLE ECONOMY IN ROLLING MILL MOTOR ROOM

One of 136 models with volumes to 200,000 CFM and pressures to 11" wg. WRITE FOR FREE BULLETIN 162-41

JOY AXIVANE FANS

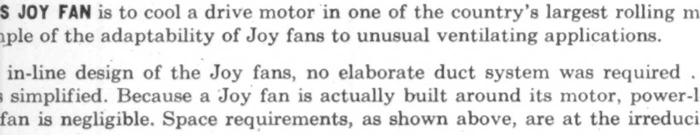
THE JOB OF THIS JOY FAN is to cool a drive motor in one of the country's largest rolling mills . . . . good example of the adaptability of Joy fans to unusual ventilating applications.

BECAUSE of the in-line design of the Joy fans, no elaborate duct system was required . . . installation was simplified. Because a Joy fan is actually built around its motor, power-loss from motor to fan is negligible. Space requirements, as shown above, are at the irreducible minimum.

JOY AXIVANE FANS will show you new standards in efficiency, compactness, quietness, and outstanding versatility. Get the full story by writing to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

WSW I 6539-162

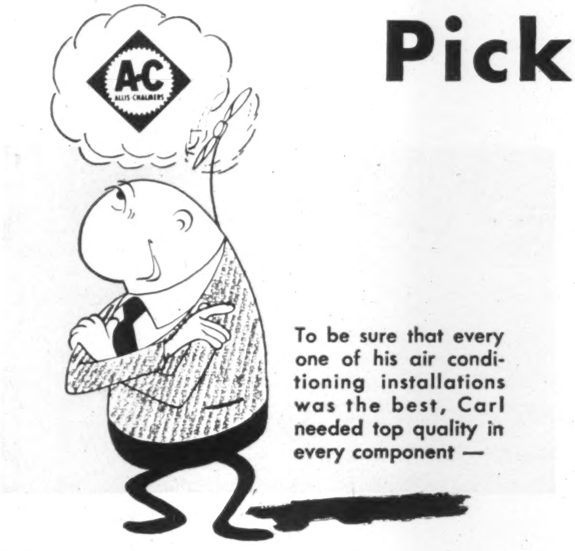
JOY . . . EQUIPMENT FOR INDUSTRIAL PLANTS . . . FOR ALL INDUSTRY



STATIONARY AIR and GAS COMPRESSORS • NON-LUBRICATED COMPRESSORS • BOOSTER COMPRESSORS VACUUM PUMPS • PORTABLE COMPRESSORS • INDUSTRIAL FANS • PORTABLE BLOWERS • FOUNDATION BREAKERS • HOISTS • ELECTRICAL PLUGS, RECEPTACLES and POWER DISTRIBUTION SYSTEMS

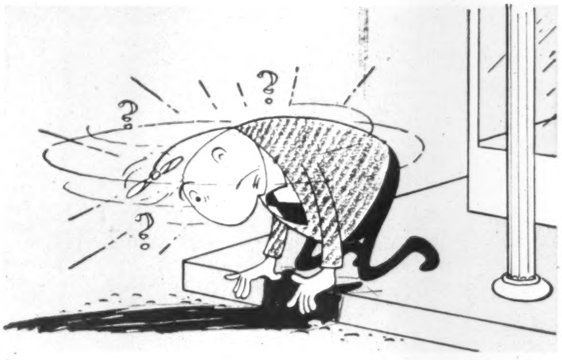
HOW *Cool Carl* the Competent Contractor

Picked Quality



To be sure that every one of his air conditioning installations was the best, Carl needed top quality in every component —

He knew he couldn't pay a premium price



He knew he couldn't find quality on a street corner

He knew he couldn't afford trial-and-error

He knew . . .

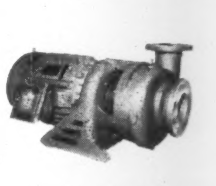
ALLIS-CHALMERS Air Conditioning Pumps

Give season-after-season dependability . . . at low cost per gallon pumped

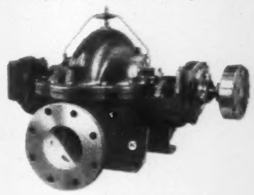
Cool Carl hit quality "right on the nose" and so reduced service call-backs when he specified Allis-Chalmers air conditioning pumps.

Like so many air conditioning contractors, Carl knew that Allis-Chalmers pumps offer: HIGH HYDRAULIC EFFICIENCY; NO-MAINTENANCE SEALING; MOISTURE-PROOF BEARINGS; and many other cost-saving design features.

You'll get top quality too by specifying Allis-Chalmers pumps. See your local A-C representative or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.



Fractional and Integral Horsepower pump line has capacities to 2500 gpm, heads to 400 feet. Close-coupled models have only two base sizes for entire line . . . only two bolts needed to install.



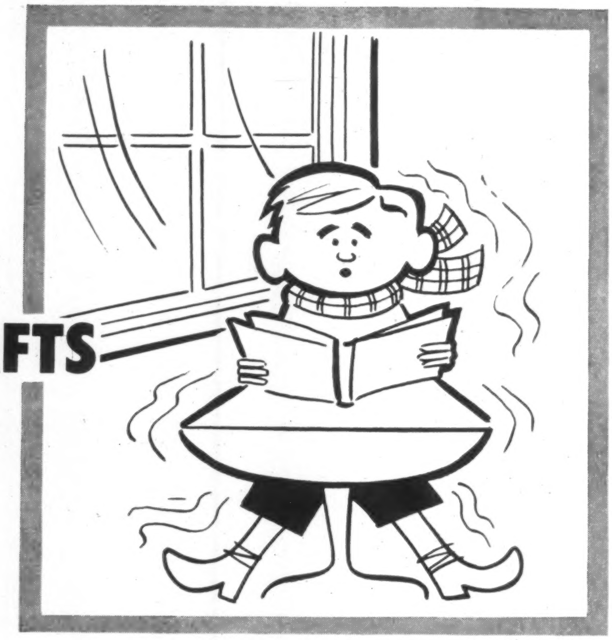
Other Types of Centrifugal Pumps by Allis-Chalmers provide heads up to 550 feet and capacities to 2500 gpm. Various models available cover 99% of all air conditioning jobs.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

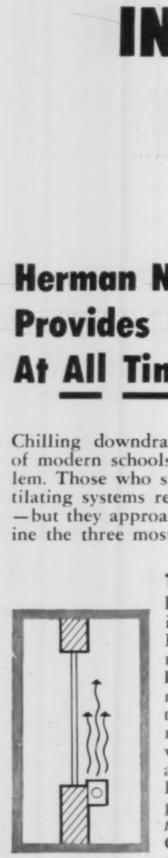
A-5239

How To Control WINDOW DOWNDRAFTS IN CLASSROOMS EFFECTIVELY

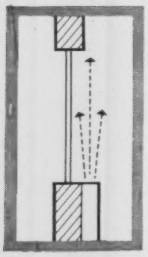


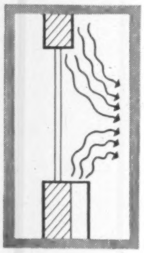
Herman Nelson DRAFT|STOP* System Provides 100% Control At All Times That Drafts Exist

Chilling downdrafts from the typically large window areas of modern schools present a serious health and comfort problem. Those who specialize in school heating, cooling and ventilating systems recognize that these drafts must be controlled—but they approach the problem in different ways. Let's examine the three most widely used methods:

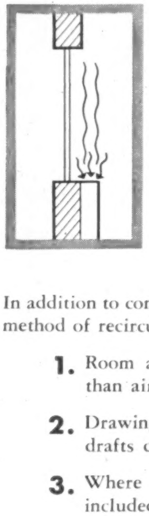


The Heat Barrier. With this method, a hot water or steam pipe (usually finned tubing) runs along the wall below the windows. Heat rising from this pipe is intended to warm the window area sufficiently to prevent drafts. Disregarding any other objections to this method, it has one serious deficiency: repeated tests have shown that occupied classrooms require cooling up to 70% of the time—even when outside temperatures are as low as 10° above zero. Obviously, when the unit ventilator is cooling, the hot water or steam supply pipe cools off. In many cases, this means that *there is no draft protection 70% of the time.* On the other hand, if heat is maintained in the wall piping at all times, it increases the cooling load with consequent fuel waste.





Another approach to the window draft problem uses a *Warm Air Curtain,* blown upward from louvers at the base of the windows. This warm air is secured by diverting some of the heated air from the unit ventilator. This system defeats its purpose for the same reason that the "heat barrier" fails. When the unit ventilator is cooling, there is a *cool* draft from the louvers. It meets the cold window downdraft and, since cold air tends to fall, both spill into the classrooms at shoulder level.



The Herman Nelson patented DRAFT|STOP system works on a completely different principle. It is not dependent upon heat in any way. DRAFT|STOP louvers extend along the window wall area. Cold window downdrafts are drawn into the louvers and returned to the unit ventilator. There, depending upon the heat requirements of the room, they are either warmed or mixed with fresh outdoor air and gently circulated. The DRAFT|STOP system controls window downdrafts 100% of the time because it does not depend on heat. When outdoor temperatures reach 60° or higher, window downdrafts do not exist. At all temperatures below that, Herman Nelson unit ventilators recirculate sufficient room air through the DRAFT|STOP window sill grille to trap downdrafts effectively.

In addition to controlling window downdrafts, the DRAFT|STOP method of recirculating room air has three other advantages:

1. Room air picked up at window sill level is cleaner than air drawn from the floor level.
2. Drawing air from the window level prevents ankle drafts caused by movement of air across the floor.
3. Where storage cabinets are desired, DRAFT|STOP is included at no additional cost.

Would you like more information on the famous DRAFT|STOP* system of classroom cooling, heating and ventilating? Ask your Herman Nelson representative or write to Herman Nelson Products, American Air Filter Company, Inc., Louisville 8, Kentucky.

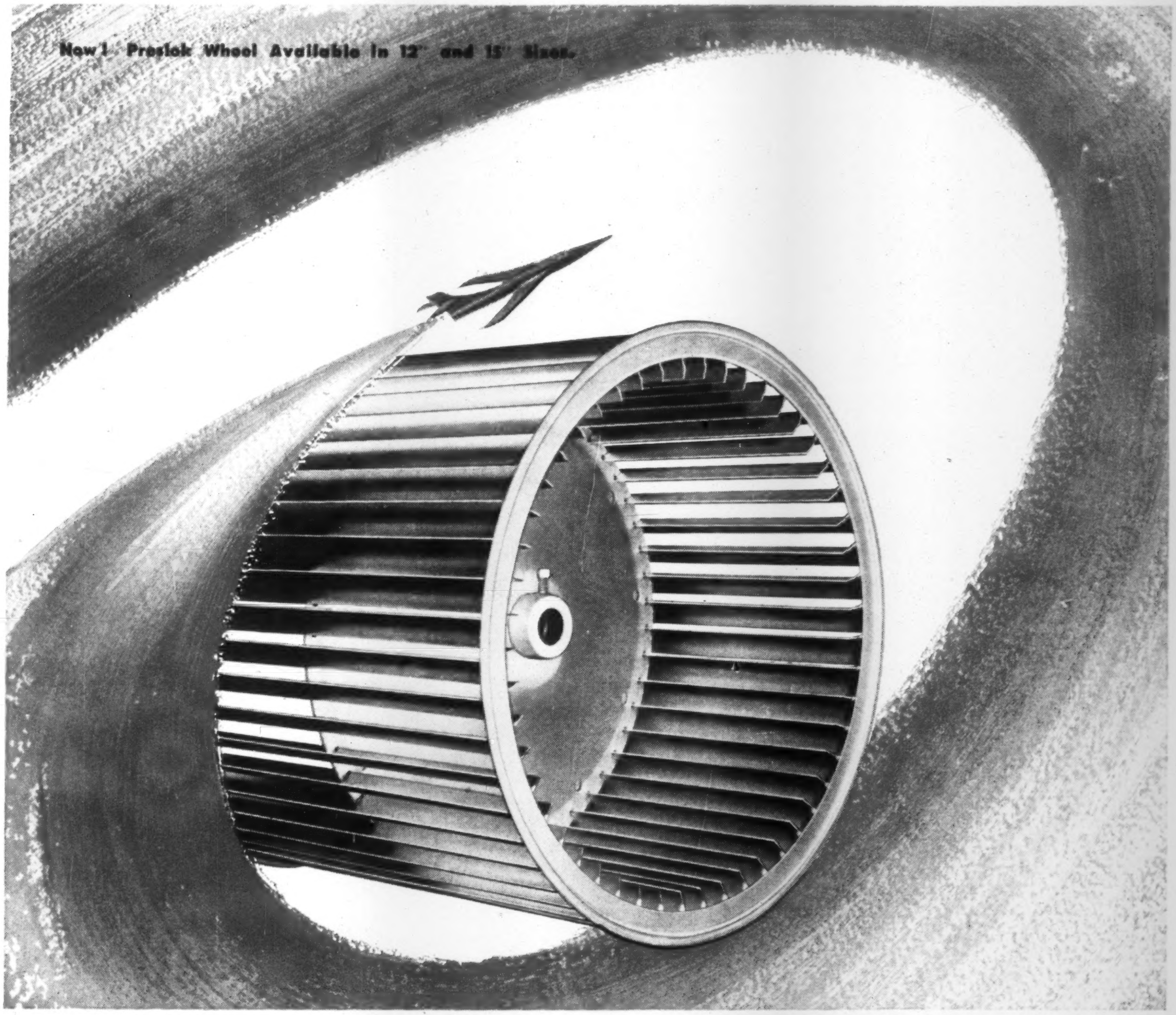
*Patented—there are no substitutes.

AAF

herman nelson

UNIT VENTILATOR PRODUCTS

American Air Filter Company, Inc.
System of Classroom Cooling, Heating and Ventilating


New! Preslok Wheel Available in 12" and 15" Sizes.

GIVE YOURSELF A SPEED 'MARGIN OF SAFETY'

Specify Preslok® Wheel . . . Guarantees 50% More Operating Speed

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Are your modern air conditioning requirements calling for greater speeds, higher statics? *Preslok is guaranteed to increase your operating speed maximums by at least 50%!* With Preslok, the center disc grips the blade mechanically by an exclusive Lau locking method. Four disc fingers slip into the blade aperture and are pressed together in locking position. *Preslok eliminates ballooning at higher speeds . . . insures a quiet operation.*

One more advance for Lau engineering. One more answer to the needs of original equipment manufacturers, made possible by superior Lau engineering and production skills.

The Lau engineering skills are available to the entire air-moving industry . . . and specifically to your business *whenever you need them.*

Perhaps your organization is confronted with a difficult air-moving problem right now. If so, why don't you call in Lau, who have pioneered so many advances in more than 25 years of service. Write Dept. M, today.

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World's Largest Manufacturer of Air-Conditioning Blowers

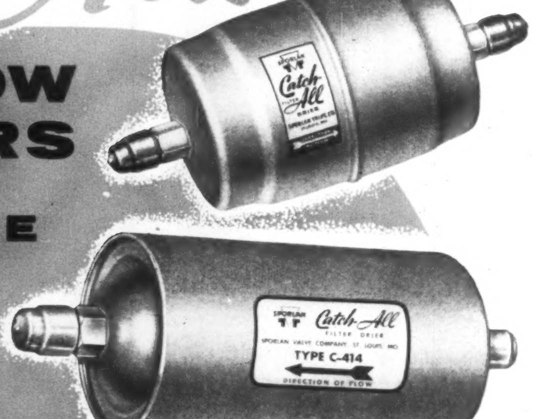
3-57

Get Peak Filtering, Drying and Acid Removal at All Times...

with SPORLAN *Catch-Alls*

The FULL FLOW FILTER-DRIERS *that are installed in the* MAIN LIQUID LINE

Not in a By-Pass


SPORLAN
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TYPE C-414
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ACTIVATED CORE
For Replaceable Core Catch-All Shell No.

Whether your job calls for sealed or replaceable core Catch-Alls... for refrigeration or for air conditioning installations all the way up to **100 TONS** Refrigerant 12, nothing matches the Peak Performance of the famous Sporlan molded porous Catch-All Cores.

They keep refrigeration and air conditioning systems so perfectly clean, perfectly dry and acid-free because... **They cannot powder... they cannot pack**

The refrigerant cannot by-pass or channel around them

They offer full flow capacity with negligible pressure drop through superior design

They are activated to a high degree of dryness, then sealed to insure Peak Performance when installed, so, for Peak Filtering, Drying and acid removal at all times... buy Sporlan Catch-Alls from your wholesaler today.

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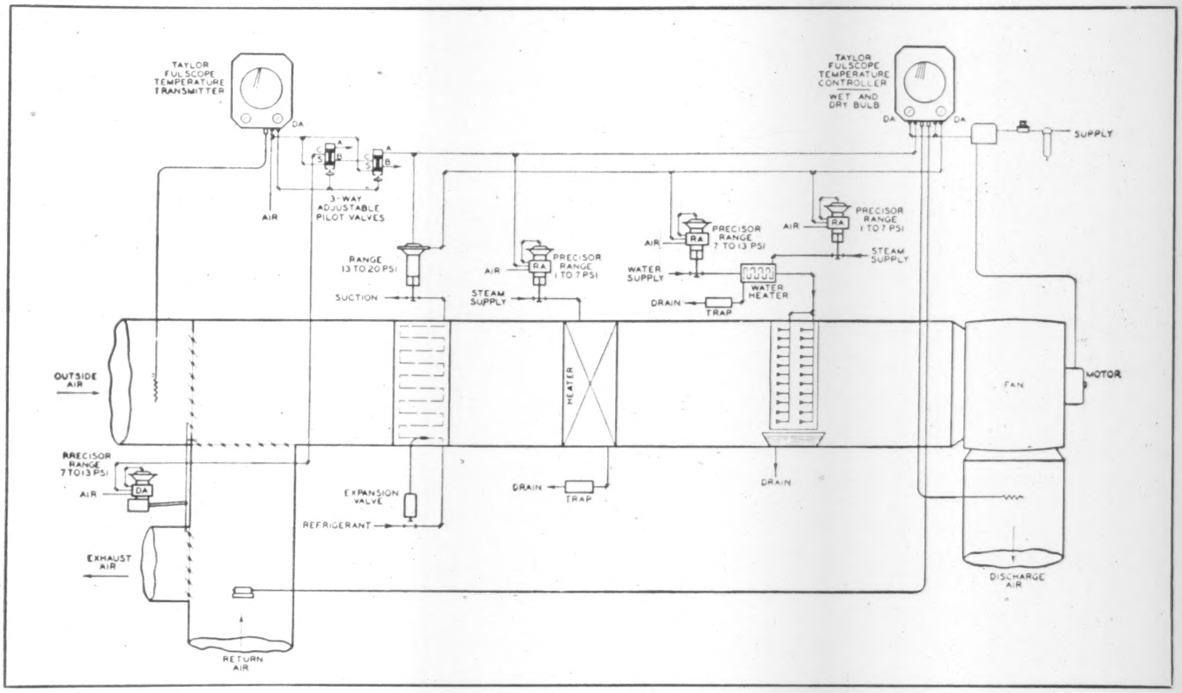
TAYLOR FULSCOPE TEMPERATURE TRANSMITTER
DA
A
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AIR
3-WAY ADJUSTABLE PILOT VALVES
TAYLOR FULSCOPE TEMPERATURE CONTROLLER
WET AND DRY BULB
DA
DA
SUPPLY
PRECISOR RANGE 1 TO 7 PSI
AIR
RA
PRECISOR RANGE 7 TO 13 PSI
AIR
RA
STEAM SUPPLY
RANGE 13 TO 20 PSI
PRECISOR RANGE 1 TO 7 PSI
AIR
RA
WATER SUPPLY
WATER HEATER
DRAIN
TRAP
SUCTION
STEAM SUPPLY
OUTSIDE AIR
HEATER
FAN
MOTOR
RRECISOR RANGE 7 TO 13 PSI
AIR
DA
EXPANSION VALVE
REFRIGERANT
DRAIN
TRAP
DRAIN
EXHAUST AIR
RETURN AIR
DISCHARGE AIR

It's easier than you think to have

COMPLETE AIR CONDITIONING

WE don't know what's holding you back from a complete air conditioning job. At least it shouldn't be the cost of instrumentation. The system shown above not only gives all the accustomed Taylor accuracy and dependability, but it costs little more than makeshift or inadequate controls. The versatility and adaptability of FULSCOPE* air-operated controllers and our wide experience in instrument application are responsible for the economies.

Specifically, those two Taylor FULSCOPE Recording Temperature Controllers shown in the drawing control all four phases of complete air conditioning:

1 HEATING
2 COOLING
3 HUMIDIFYING
4 DEHUMIDIFYING

The temperature-sensitive element in the discharge air duct measures temperature of air going into room. An increase in this temperature closes the steam valve. Further demand for cooling gradually opens the outdoor dampers and closes the return air damper. For additional cooling, the back-pressure valve opens to lower the refrigeration coil temperature.

When humidity decreases, the wet-bulb control system opens spray water valve. When additional moisture is required steam valve heats spray water. An increase in humidity closes steam and water valves and opens refrigeration back-pressure valve. Dehumidification is accomplished by condensing moisture out of the air onto the coooling coil.

Whatever kind of air conditioning you want—for employee comfort or product quality or both—Taylor controls will help you get top efficiency out of your equipment. Ask your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Taylor Instruments
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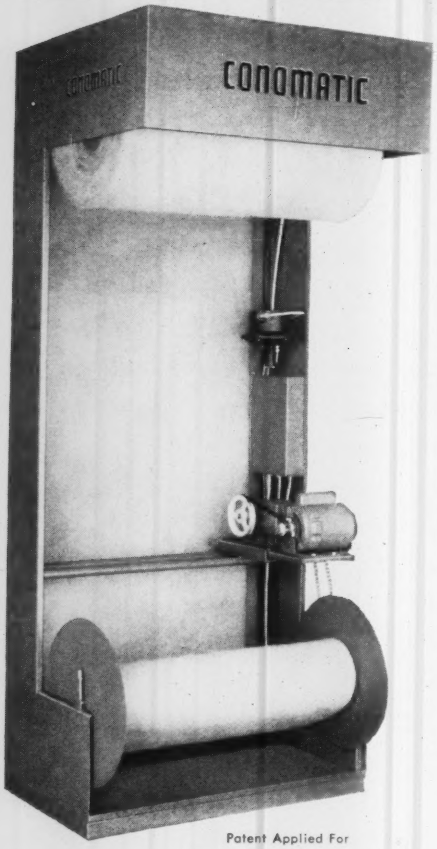
ACCURACY FIRST

VISION · INGENUITY · DEPENDABILITY

*Reg. U.S. Pat. Off.

NOW ...NEW
CONOMATIC



Patent Applied For

CONTINENTAL'S
AUTOMATIC ROLL-AWAY
AIR FILTER
clears the air...

For ECONOMY and unattended SAFE-SURENESS, Conomatic offers these exclusive features:

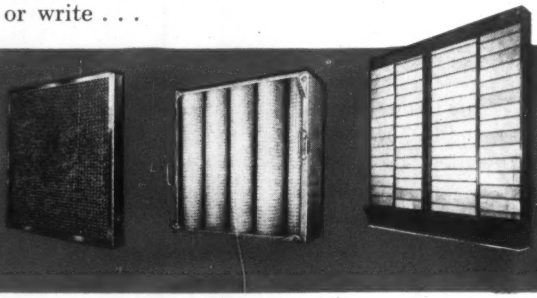
1. **More effective area** provides more effective filtering surface size for size—hence longer life.
2. **Media saver** Low-resistance cut-off switch does 2 things:
   a. Prevents timed drive mechanism from rolling away media not fully loaded—thus extends media life.
   b. Eliminates need for interconnecting with fan circuit, since filter media cannot advance unless fans are operating.
3. **Positive curtain movement** assures 2 advantages:
   a. Controls feeding of pre-determined measure of media.
   b. Minimizes maintenance problems by using *direct drive* for take-up roll.
4. **Media overload pressure switch** is available as optional equipment to accelerate media advance in event of unusual excessive dust load.

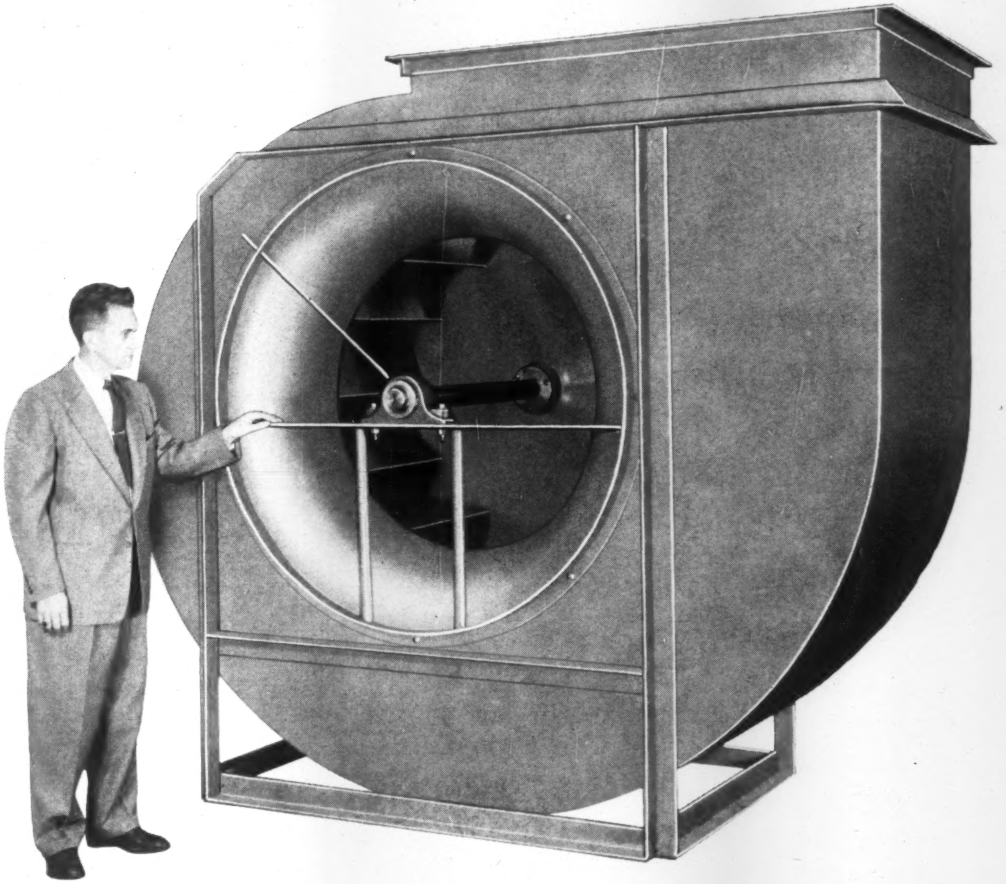
Ask the Continental representative in your area for full details, or write . . .

AIR CONTINENTAL FILTERS

P. O. BOX 1647 LOUISVILLE 1, KY.

CONTINENTAL
AIR FILTERS Inc.





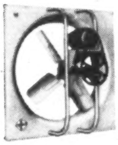
BIG BLOWERS ARE BIG BUSINESS WITH PEERLESS

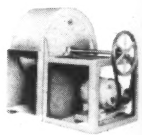
QUIET! • TROUBLE-FREE! • DEPENDABLE! • HEAVY DUTY! • GUARANTEED!

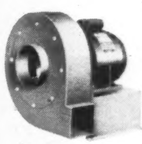
Versatility in size, application, and engineering has always been a Peerless strong point. Peerless builds its own motors and matches them to the specified blower requirements. Peerless blower frames and housings are usually heavier than any competitive products. Result—a quiet, vibration-free unit.

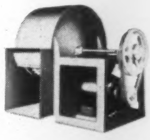
These are not "off-the-shelf" units, but built to customer rotation and discharge specifications. Each one receives 100% inspection before it leaves the Peerless factory. Each unit is built to NAFM standards. Motors are built to NEMA standards. Each unit is ready for operation when received at the installation site.

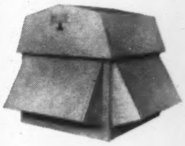
A COMPLETE LINE OF AIR MOVING EQUIPMENT











Charter Member of the Air Moving and Conditioning Association, Inc. (AMCA)

Peerless® Electric

FAN AND BLOWER DIVISION

THE Peerless Electric® COMPANY

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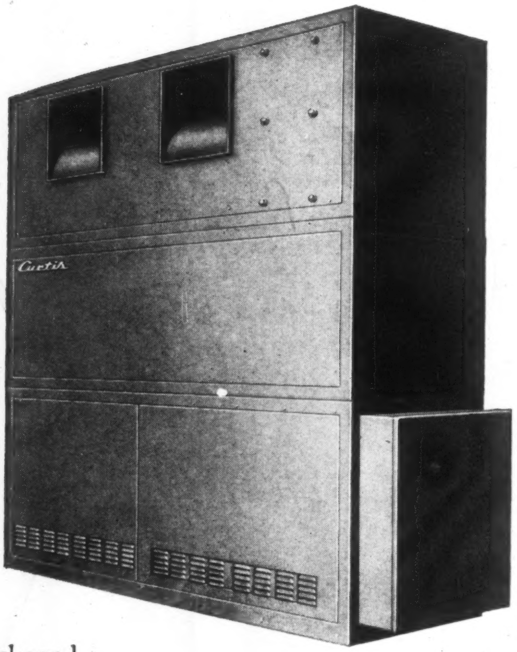
FANS • BLOWERS • ELECTRIC MOTORS • ELECTRONIC EQUIPMENT

Write Today for Bulletins SDA-220, SDA-200 and SDA-160.

NOW!

Curtis

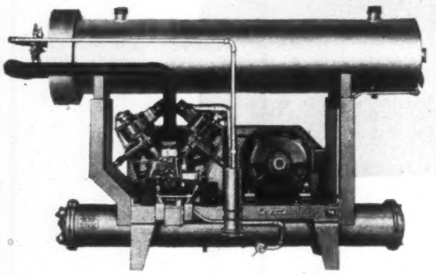
PACKAGED UNITS
Up to 50 Tons
OPENS NEW MARKETS FOR PACKAGED AIR CONDITIONING



No question about it. The new 50-ton Curtis packaged air conditioner will open a new sales front for you. Architects, engineers *and* owners prefer packaged units for important reasons:

- Big package units are line assembled—does away with expense of field labor. Assures a BALANCED SYSTEM.
- Packaged units are easier to install—take up less space.
- Cuts down installation problems and maintenance costs.

IMPROVED PACKAGED LIQUID CHILLER... FOR WET HEAT SYSTEMS



up to 100 tons—

With all controls in single panel box for easier access and greater protection! Four step capacity control—unloaded starting available. Particularly desirable where year 'round conditioning of multiple individual rooms is required.

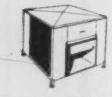
REMEMBER, every Curtis unit is backed by a solid 103 years of experience and skill. Curtis offers a complete line of air conditioning equipment—nationally advertised to help you sell.

REMEMBER... YOU CAN COUNT ON **Curtis**

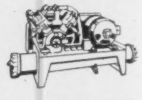
OUR 103rd YEAR

MANUFACTURING COMPANY
REFRIGERATION DIVISION
1950 Klenlen Ave. St. Louis 20, Mo.

CM-16



New Curtis Packaged, Air Cooled, Air Conditioning Units, 3 thru 7½ tons. Residential and commercial applications.

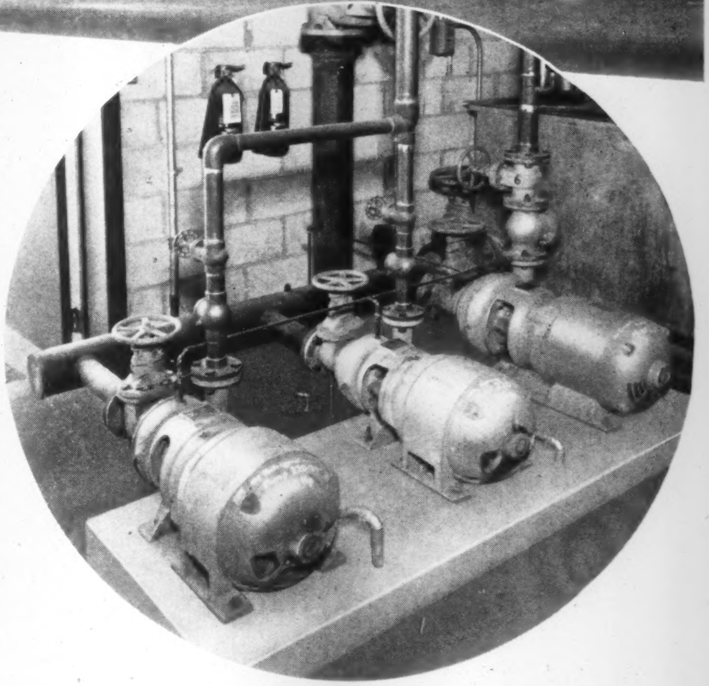


Condensing Units up to 100 tons. F-12 or F-22.

Air Handling Units, Cooling Towers and Evaporative Condensers to match.

another new supermarket another MOTOR PUMP installation...

PENN FRUIT
penn fruit co.
AIR CONDITIONED
BAUSE DRUGS



Dependable and economical Ingersoll-Rand Motorpumps help assure operation of the New Supermarket's 100 ton air conditioning system.

Air conditioning architects, engineers and contractors who know the importance of customer satisfaction, are depending more and more on Ingersoll-Rand Motorpumps for care-free, trouble-free service.

Advanced features and rugged construction of I-R Motorpumps for air conditioning have meant an end to costly breakdowns. Low-cost operation and ease of installation make them the natural choice for air conditioning systems.

For additional information contact your nearby Ingersoll-Rand representative or write for data to Ingersoll-Rand Cameron Pump Div., 11 Broadway, New York 4, N. Y.

Features like these set the pace with years-ahead performance:

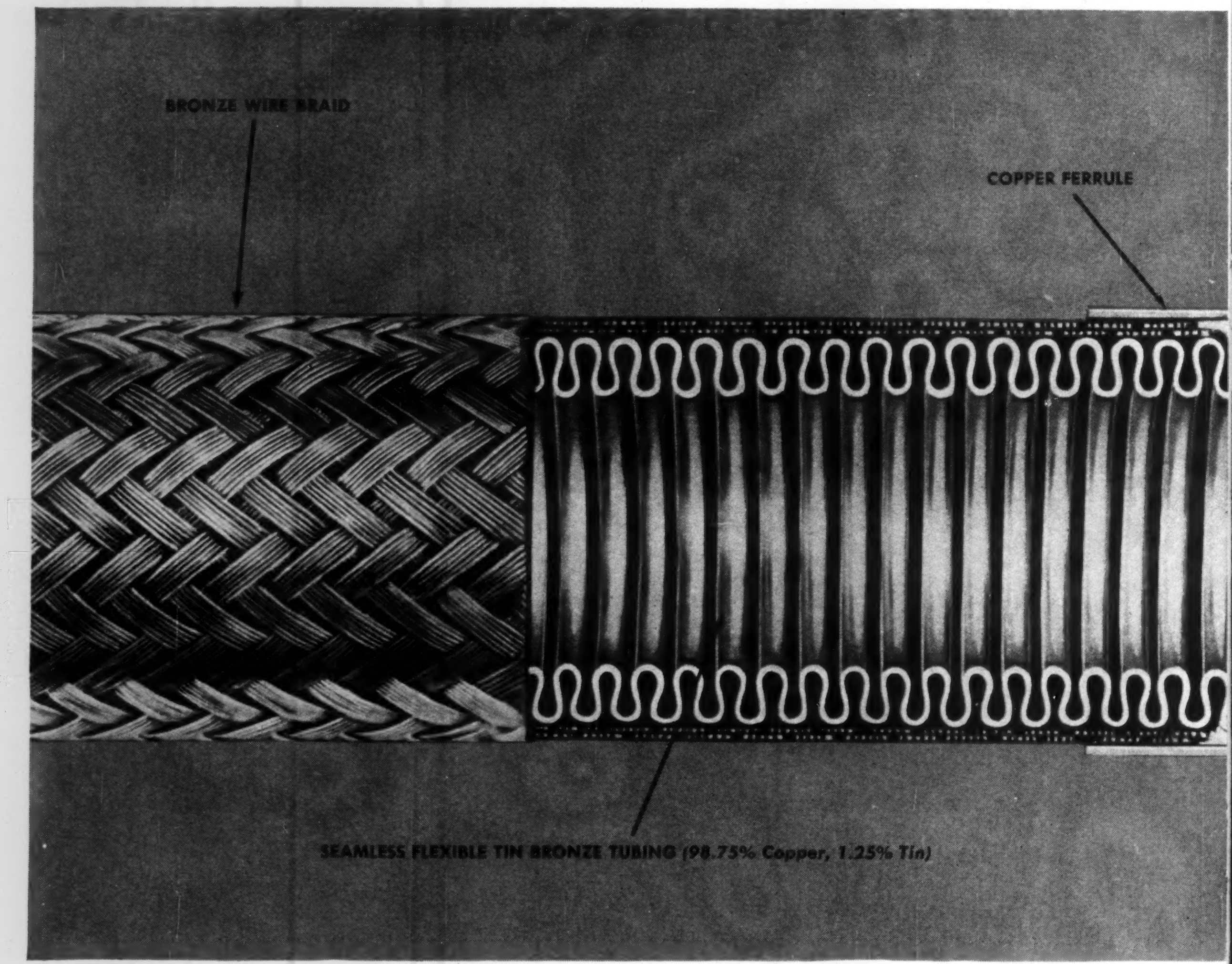
- **Compact, space-saving**
- **Operate in any position**
- **Simple installation**
- **Sizes up to 75 hp**

Ingersoll-Rand

V-419

Cameron Pump Division
11 Broadway, New York 4, N. Y.

PUMPS • COMPRESORS • TURBO-BLOWERS • VACUUM EQUIPMENT • ROCK DRILLS
AIR & ELECTRIC TOOLS • GAS & DIESEL ENGINES


BRONZE WIRE BRAID
COPPER FERRULE
SEAMLESS FLEXIBLE TIN BRONZE TUBING (98.75% Copper, 1.25% Tin)

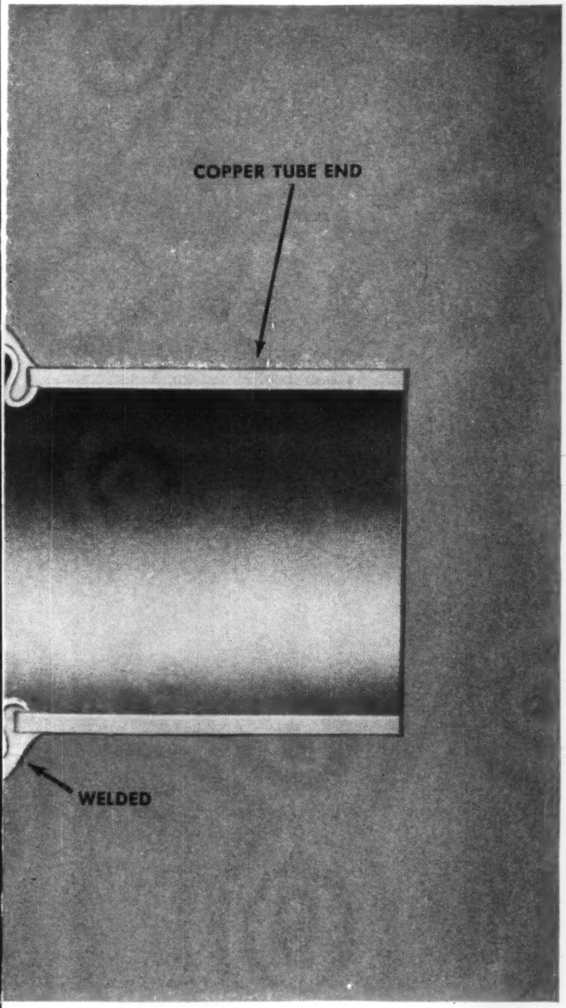
See how the right construction gives you ...with American Vibration Eliminators

The right metal for the job. Core of the American VE is a seamless, flexible tubing made of a *special tin-bronze alloy* tailored specifically for the refrigeration and air conditioning industries — engineered to stand up under vibration while carrying gases and liquids under pressure. Because the core is *seamless*, there are no joints or laps where leaks can start.

For extra strength and durability, the flexible core is covered with bronze wire braid securely brazed in place. Double braid affords extra protection on all American VE's 2⅝" O.D. or larger.

Clean, dry, tested, protected. Before it is shipped, the final assembly is cleaned, pressure-tested, oven-dried, and sealed in a vaporproof polyethylene bag. You have a factory-fresh unit to install in the line . . . clean, inside and out!

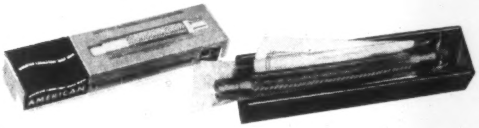
Packaged for your convenience, protection. Boxes containing American VE's are sturdy, easy to open, easy to identify. No confusion or fumbling. Simplified installation instructions in each box make your job easier. Insist on VE's with the stamping "American" on the ferrule . . . an Anaconda product.



lasting performance

AMERICAN VIBRATION ELIMINATORS—*listed by Underwriters' Laboratories through sizes 3⅝" O.D.*—are sold by leading distributors everywhere. For descriptive folder, write: The American Brass Co., American Metal Hose Division, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.

57206



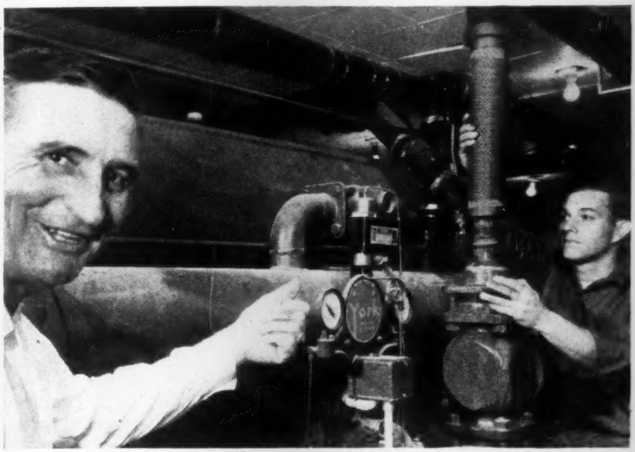
WHEREVER CONNECTORS MUST MOVE

AMERICAN

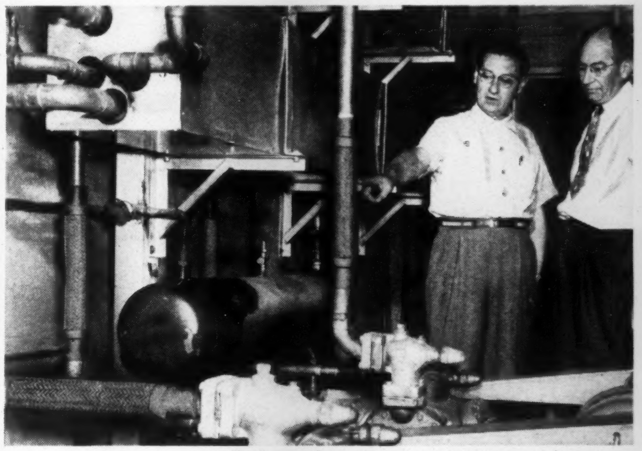
For American Vibration Eliminators see your

ANACONDA® DISTRIBUTOR

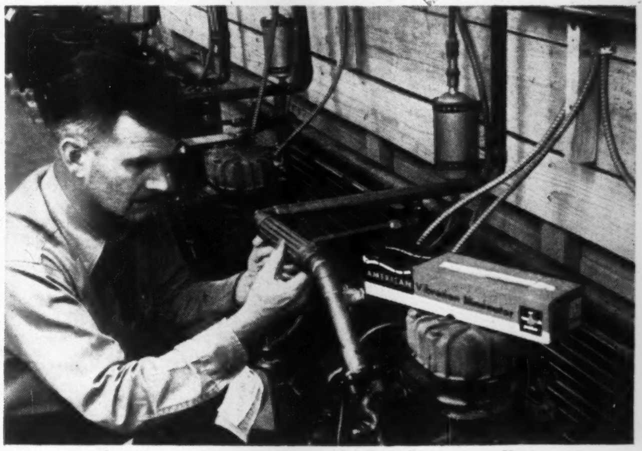
Users of American VE's say...



"**AMERICAN** Vibration Eliminators are insurance against costly return service calls"—Tom Stough, Co-owner, Southern Air Conditioning and Refrigeration Co., Hot Springs, Arkansas.

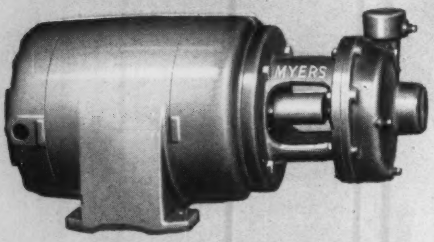


"**17 YEARS AGO** we installed our first American VE's—and they're still our choice today"—S. L. Sloan, Jr., Mechanical Air, Inc., Rochester, New York.

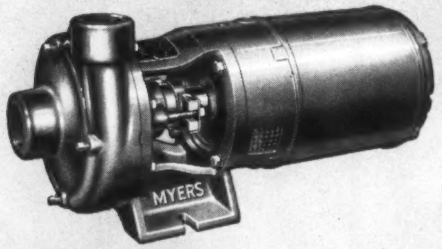


"**LOW-COST** business insurance . . . that's what we call American Vibration Eliminators"—United Refrigeration Service, Inc., Columbus, Ohio.

Model 150 M Model 200 M
Shown with rotary seal
(available with stuffing box)

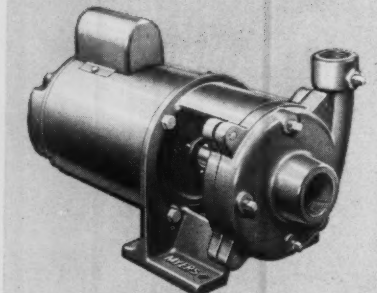


Model 125 M Model 150 M
Shown with stuffing box
(available with rotary seal)

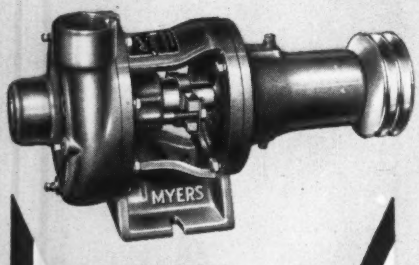


98 MODELS

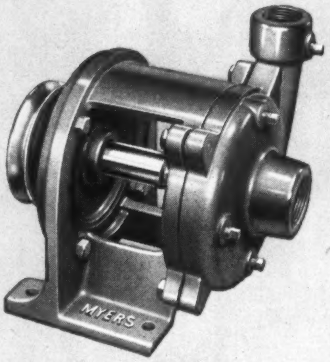
of Myers Centri-Thrift Pumps for air conditioning



Model 100 M
Rotary seal only



Model 125 B
Model 150 B
Model 200 B
Shown with stuffing box
(available with rotary seal)



Model 100 B
Rotary seal only

CHOICE OF MOTORS—Single or three phase, single or dual voltage, open or enclosed.

WIDE SELECTION OF SIZES—1″ x 1¼″, 1¼″ x 1½″, 1½″ x 2″, 2″ x 2½″, threaded discharge and suction. ⅓, ½, ¾, 1, 2, 3, 5 and 7½ horsepower, motor-mounted or belt-driven.

CHOICE OF SHAFT SEALING—Regularly fitted with rotary seal. Stuffing box may be specified on "125", "150" and "200" models.

WIDE RANGE OF CAPACITIES AND HEADS—Capacities to 240 GPM. Heads up to 140 feet.

OUTSTANDING QUALITY FEATURES

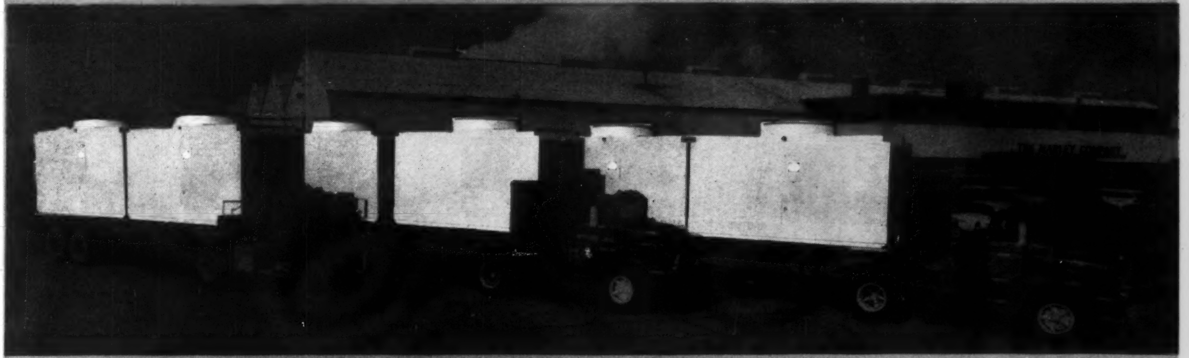
- All-bronze impeller, accurately balanced for smooth operation.
- Removable bronze wearing rings, easily replaced for longer pump life.
- Corrosion resistant, stainless steel shaft for trouble-free service.

Write today for Bulletin 210 on Myers Centri-Thrift Pumps

Myers® PUMPS **WATER SYSTEMS AND WATER CONDITIONERS**

The F. E. Myers & Bro. Co., Ashland, Ohio • Kitchener, Ont. Myers®

Hoist it . . . Pipe it . . . Wire it . . . It's in Service! That's why NEW PACKAGED DOUBLE-FLOW AQUATOWERS* (80, 100 and 125 Tons Nominal Capacity) are selling by the Dozen!



These six Packaged Double-Flow Aquatowers are half of an order for installation for a single industrial concern

Redesigned for greater utility, increased durability and reduced installation cost — that's the story behind the rapid acceptance of New Packaged Double-Flow Aquatowers by engineers and contractors. Cost-wise and performance-wise they are tops in the 80- to 125-ton field for they are built to go on the job quicker, do a better job and do it longer than any other packaged product.

Because they are shipped assembled, Marley's new "packaged" Double-Flow Aquatowers do not involve the costly field labor usually associated with installing towers of intermediate capacity. In special situations, they can be partially disassembled into 3 sections and installed quickly. And if necessary, "packaged" Double-Flow Aquatowers can be completely disassembled and put back together with ease and speed.

Easy installation is only one facet of the "packaged" Double-Flow Aquatower's universal popularity with contractors, engineers and users. More important is the proven and unparalleled performance . . . the industrial-type multi-blade cast fan . . . the economy of operation . . . the low, clean-cut silhouette . . . the long-lived baked MarClad plastic finish. For complete data on design, construction, engineering features and performance, call your Marley representative in any of 55 cities.

*Trademark Reg.

The Marley Company
Kansas City, Missouri

MARLEY

These profit-making benefits sold me on American Blower Packaged Air Conditioners

$ You handle a complete line of packaged air conditioners. Sizes from 3 to 20 tons.

(Lets you bid on *any* commercial job!)

$ Ruggedly designed for years of trouble-free performance.

(Why let service call-backs rob you of your profit margin?)

$ All models engineered with you in mind. Easy access to unit through full-size front panels.

(You don't have to be a contortionist to service these air conditioners!)

$ Complete customer satisfaction. Units are comfort-engineered for efficient, quiet operation. All-new decorator styling; and a full five-year warranty on the complete refrigeration system.

(The word gets around – it's nice for repeat business!)

$ Your sales effort factory-backed with hard-hitting advertising, merchandising aids, sales-training plan, and a flexible co-operative advertising program. All this designed for *you* by American Blower – a leader in air handling and air conditioning for over 75 years.

(Your prospects are pre-sold – you have a ready-made market!)

$$ **Total** these advantages – they can add up to many more customer sales and greater net profits.

SO ACT TODAY! Start earning those increased profits now! For full information on how you can handle American Blower's 1957 Packaged Air Conditioner line, write: American Blower Division of American-Standard, Detroit 32, Michigan.

DISTRIBUTORS: Choice territories are still available. Send for franchise data, today.

AMERICAN BLOWER

Division of American-Standard

AIR-CONDITIONING EQUIPMENT FOR EVERY BUSINESS

keep coolers
from freezing

install
ALCO
Evaporator
Pressure
Regulators

Alco EPRs hold evaporator pressure to a predetermined level regardless of load changes. Prevents freeze-up and damage to water chillers and beverage coolers. Prevents dehumidification in vegetable and other produce cases.

THEY COME APART IN THE LINE FOR QUICK, EASY SERVICING

See your Alco wholesaler

ALCO

ALCO VALVE CO.
861 KINGSLAND AVE. • ST. LOUIS 5, MO.

The one complete line of refrigerant controls: Thermostatic Expansion Valves, Refrigerant Distributors, Solenoid Valves, Suction Line Regulators, Flooded Evaporator Controls and Reversing Valves.

BUY QUALITY • BUY ALCO

7306

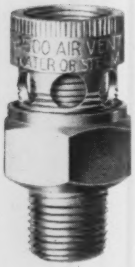
HOFFMAN WATER VENTS

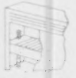
FOR RESIDENTIAL, INDUSTRIAL AND PROCESS APPLICATIONS

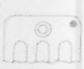
GUARDIAN OF YOUR HEALTH AND COMFORT

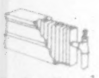
VENT THE AIR AUTOMATICALLY FROM HOT AND CHILLED WATER SYSTEMS WITH PRESSURES UP TO 150 P.S.I.

NO. 500 WATER VENT




For Convector Radiation


For Standing Radiation


For Baseboard Radiation

This Hoffman Disc type valve vents all systems automatically! Adjusts for manual, steam or hot water venting. Valve can be cleaned of leak-sealing compounds or minerals without draining the system. Hygroscopic Fibre Discs automatically open to allow air to vent, close against steam or water. Selector screw controls venting rate. Size conn.: ⅛″. Max. wtr. press.: 50 P.S.I.

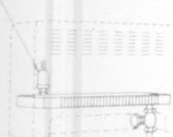
NO. 79 WATER VENT

WILL WITHSTAND HYDROSTATIC PRESSURES OF 200 P. S. I.

Designed for use on hot or cold water mains and process applications, this Hoffman Water Vent positively removes air from the piping of any water system. Tapped at top for ¼″ I.P.S. safety drain connection for discharging moisture entrained in the vented air. Size conn.: ¾″ Male, ½″ Female. Max. oper. press.: 75 P.S.I.

NO. 790 WATER VENT

Nº 790 AIR VENT

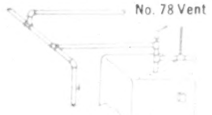


A typically fine quality Hoffman Vent Valve especially designed for venting convectors, baseboard and wall radiation. Assures positive venting and continuous removal of air from system. If dirt should lodge between pin and seat, cap can be tightened down to prevent spitting until valve is cleaned. Safety drain connection at top for discharging moisture entrained in the vented air. Fitting and Ferrule for 3/16″ O.D. tubing. Size conn.: ⅛″. Max. operating press.: 30 P.S.I.

NO. 78 WATER VENT

WILL WITHSTAND HYDROSTATIC PRESSURES OF 450 P. S. I.

NO. 78
WATER
VENT
VALVE



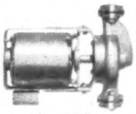
This Hoffman Valve is designed for use on high pressure hot or cold water mains and process applications. Automatically vents air from all water systems. Cast Brass Body. Safety drain connection for discharging moisture entrained in the vented air has fitting and ferrule for ¼″ O.D. tubing. Size conn.: ¾″ Male, ½″ Female, Max. operating press.: 150 P.S.I.

NO. 791 WATER VENT

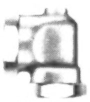
Nº 791
AIR VENT

For continuous venting on convectors and small mains where operating pressure does not exceed 50 P.S.I. all brass body and fittings. This Hoffman Valve can be easily taken apart for cleaning or removal of dirt or compounds. Safety drain connection at top (has Fitting and Ferrule for 3/16″ O.D. tubing for discharging moisture entrailed in the vented air.) Base conn.: ¼″. Max. operating press.: 50 P.S.I.

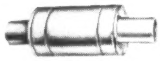
OTHER HOFFMAN WATER SYSTEM SPECIALTIES


No. 150
High Head Circulators

No. 193
Circulator Valves


No. 201
Vent Tees

No. 1500
Air Separators
"Swirlvent"


No. 250
Expansion Joints

No. 220
Expansion Tanks

SOLD ONLY THROUGH LEADING WHOLESALERS OF HEATING AND PLUMBING EQUIPMENT

Write for Hot Water Catalog No. HW-855

HOFFMAN SPECIALTY MFG. CORP. 1700 W. 10th Street, Indianapolis 7, Indiana

ACCO
for Better Values

R-P&C Valves

DESIGNED FOR DEPENDABILITY

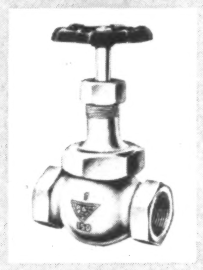


Fig. 1-A, rated for 150 lbs., has special asbestos composition disc for tight shutoff

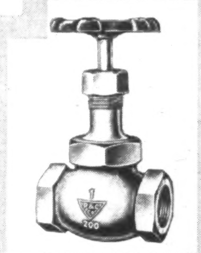


Fig. 409, rated for 200 lbs., has integral high test bronze seat for easy regrinding

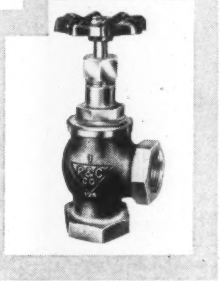


Fig 033 Angle Valve, rated for 125 lbs., has integral seat, re-grinding type disc

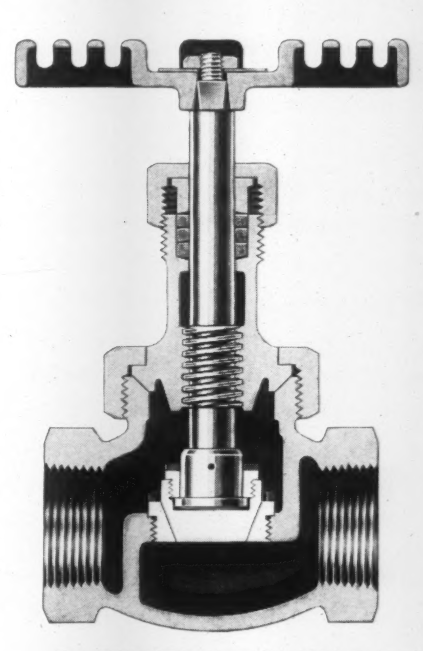


Fig. 427-DP Bronze Globe Valve

R-P&C Distributors offer 9 different models of Bronze Globe Valves—What are your requirements?

• You can select the R-P&C globe or angle valve to meet your particular requirements from a wide variety of seat and disc constructions, with union or screwed bonnet, screwed ends, in pressure classes from 125 to 300 pounds. Your R-P&C distributor offers 9 different bronze globe valves, each in a complete range of sizes—and 8 different models of angle valves which duplicate the construction features found in the globe valve line.

For example, if your application calls for frequent or continuous throttling in steam, water, oil or gas service, the **Fig. 427-DP** shown above is probably your best bet. The full plug construction gives you closer regulation. And the 500 Brinell stainless steel seat and disc resist wire drawing—give you much longer valve life.

Your R-P&C distributor can recommend the specific valve to answer your particular problem. And he has an equally wide selection in R-P&C's complete line of angle, gate and check valves in iron and cast steel, as well as forged steel gate valves. See him today.

Send for this free wall chart
"How to Protect Your Valves"

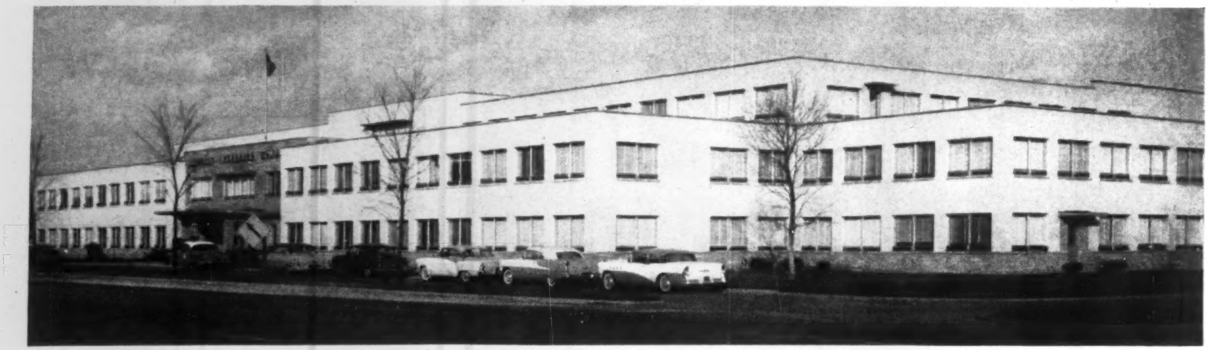
• 22 in. x 17 in. wall chart tells how to protect valves, get longer valve life—gives installation and operation pointers. Write for your copy.

R-P&C Valve Division
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO
TRADE MARK

WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY



National Home Office of the Allstate Insurance Company.

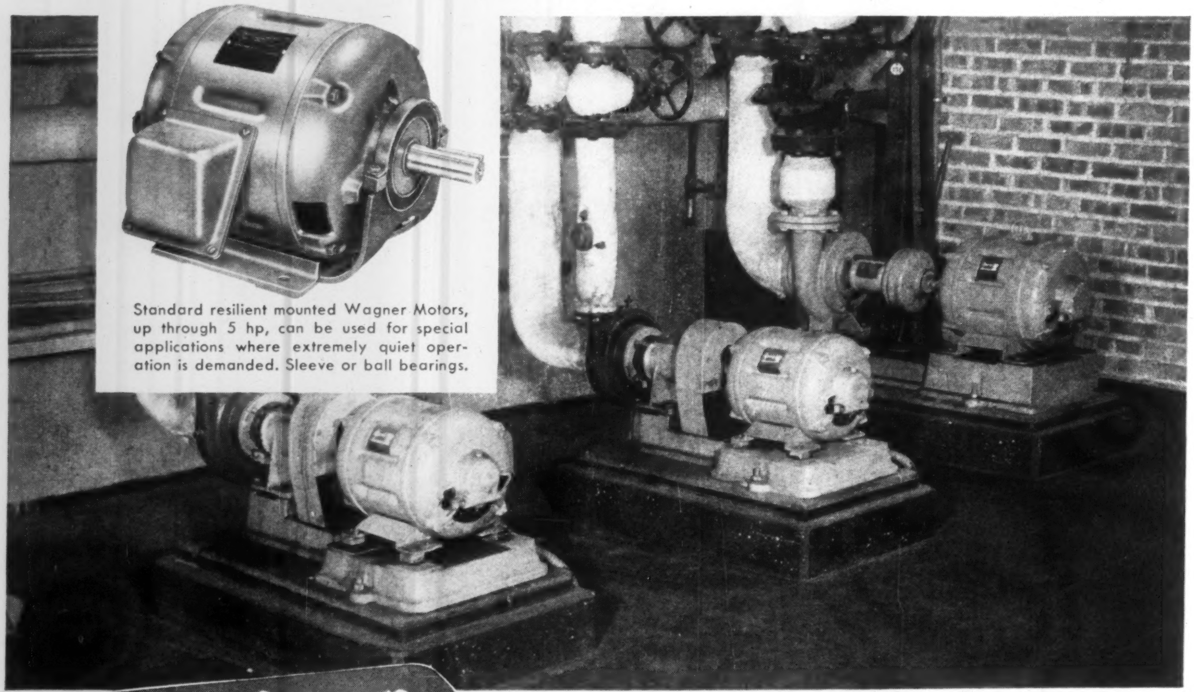
Wagner Motors help B & G Pumps meet their toughest test... QUIET OPERATION!

Circulating pumps used in hot water heating systems must be silent—vibrationless in operation, since they are the connecting links between the boiler room and the structure itself. A prime requirement for quiet pump operation is an electric motor that operates almost silently, yet has plenty of stamina to hold up under years of hard, steady operation.

That's why Bell & Gossett Company used Wagner Motors on the Universal Pumps in the Allstate Insurance Company home office. These quiet-type motors are known for smooth balance and quiet operation.

Perhaps you have a specialized motor application... if so, remember, there's a Wagner motor to fit every need... a complete line for all current specifications with a wide variety of enclosure types and mountings.

Your nearby Wagner engineer can help you select the *right* motor to meet your specifications. Call the nearest of our 32 branch offices or write us.



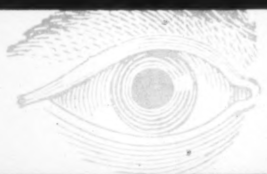
Standard resilient mounted Wagner Motors, up through 5 hp, can be used for special applications where extremely quiet operation is demanded. Sleeve or ball bearings.

Wagner
Electric Corporation
SERVING INDUSTRY SINCE 1891

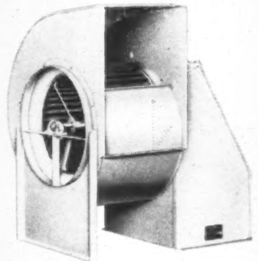
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

M57-7



A NEW LOOK AT "THE FORGOTTEN FAN"



Up on the roof, "the forgotten fan" is out of sight, out of mind . . . until wind, rain, snow and sleet cause costly breakdowns due to exposure and lubrication neglect. In the past when the heart of a blower was broken by weather, there was nothing for it but to repair or replace.

Today, after a searching look at roof blowers, Utility has a more practical answer: a complete line of quality engineered Enclosed Drive Blowers designed for punishing outdoor duty. Every one has motor and drive completely enclosed for positive protection against dirt, moisture and drastic temperature changes. Permanently sealed, pre-greased ball bearings forever prevent breakdowns due to maintenance neglect.

Best news of all: you pay no premium for this superior performance, due to Utility's progressive production techniques. So, if **you** think it's high time for a new look at blowers for roof installations, be sure to take a good look at the Utility line . . .

A DIVISION OF UTILITY APPLIANCE CORP.

UTILITY FAN CORP.

911 EAST 59TH STREET, LOS ANGELES 1, CALIFORNIA

Manufacturers of heavy
and standard duty blowers for
heating, air conditioning
and ventilating installations.
Producers of blowers
and blower parts for original
equipment manufacturers.
Write for catalogue data.

With **Youngstown Steel Pipe** on the job new **Lamson & Sessions** plant gets dependable, life-time piping system

To keep pace with the growing demand for their complete line of industrial fasteners, Lamson & Sessions Co. are erecting this new, beautiful, highly functional plant on Cleveland's Tiedeman Road. Providing dependability and long life for the plant's all-important piping system will be tons of quality Youngstown Steel Pipe.

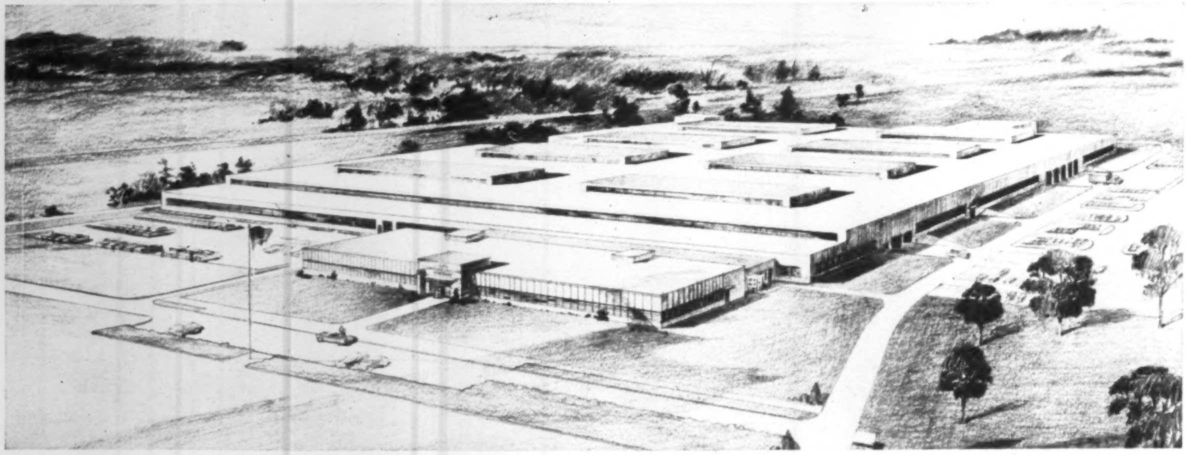
For years leading architects, as well as progressive plumbing and heating contractors, have specified Youngstown Steel Pipe because it's been their guarantee of trouble-free water piping systems.

Youngstown Steel Pipe is made of only the finest steel with exacting attention given to all sizing, threading and finishing processes. Close quality control of every step in Youngstown's fully integrated operations—from ore mining to finish threading—produces the best pipe obtainable—anywhere.

Your Youngstown Pipe Distributor is only a phone call away—why not contact him today?

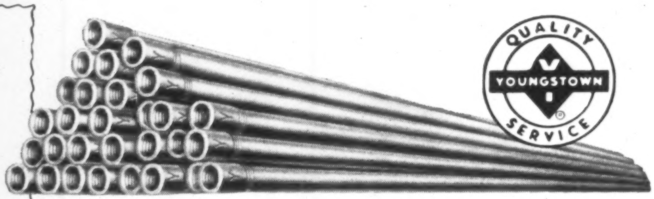
Building Owner:	Lamson & Sessions Company, Cleveland
Engineer:	The George S. Rider Company, Cleveland
General Contractor:	The Sam W. Emerson Company, Cleveland
Plumbing & Heating Contractors:	The Smith & Oby Co., Cleveland The Ed Sweeny Company, Cleveland
Distributor:	Grinnell Company, Cleveland

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities



Specify Youngstown and secure these
7 Points of uniform goodness

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness



QUALITY YOUNGSTOWN SERVICE

THE NEW *Airtherm* AIR CONDITIONING UNIT

COMBINES THE BEST TIME-PROVED FEATURES IN THE INDUSTRY

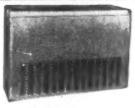
FOR NEW OR EXISTING

- ✓ OFFICES
- ✓ MOTELS
- ✓ HOTELS
- ✓ APARTMENTS
- ✓ INSTITUTIONS
- ✓ PUBLIC BUILDINGS

Here is Airtherm's answer to the demand for remote air conditioning without expensive ductwork. Features that have performed best in actual usage through the years are combined in this unit to give: (1) Maximum efficiency and operating life; (2) Quiet operation; (3) Versatility of installation; (4) Attractive appearance that blends with new or old buildings.

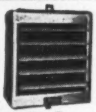
Airtherm units are made in four series from ½ to 2 ton nominal cooling capacity for cabinet or concealed installation, floor or ceiling.

AIRTHERM HEATING AND VENTILATING PRODUCTS



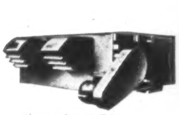
Cabinet Unit Heater

Gas Fired Unit Heater

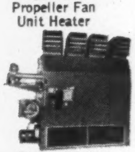


Propeller Fan Unit Heater

Convectior



Centrifugal Fan Unit Heater



Direct Fired Space Heater

MAIL COUPON FOR DETAILS

Airtherm Manufacturing Co., Dept. A
700 S. Spring • St. Louis 3, Mo.

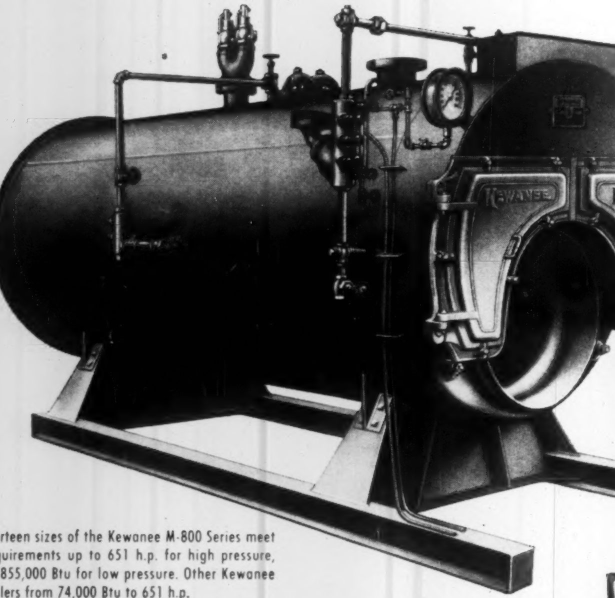
Please send specifications on the following products as checked ☐ Airtherm Air Conditioning Units ☐ Cabinet Unit Heaters ☐ Convectors ☐ Gas Fired Unit Heaters ☐ Propeller Fan Unit Heaters ☐ Centrifugal Fan Unit Heaters ☐ Direct Fired Space Heaters.

NAME ....FIRM ....

STREET ADDRESS .... CITY .... STATE ....

the men behind the KEWANEE boiler . . .

and the man **before** it!



Thirteen sizes of the Kewanee M-800 Series meet requirements up to 651 h.p. for high pressure, 21,855,000 Btu for low pressure. Other Kewanee Boilers from 74,000 Btu to 651 h.p.

Designer, purchasing agent, machinist, welder—dozens of specialists are behind the Kewanee Boiler. To them goes the credit for "cruising speed" operation . . . dependable performance . . . ease of maintenance . . . long life.

But your Kewanee Man comes *before* the boiler. He's in your office ahead of installation—even specification. He tells you of new Kewanee developments and applications. He keeps your catalog up to date. When you need specific information, he either has it or can get it quickly.

He is nearby, for the network of Kewanee Boiler representation stretches coast-to-coast. Remember to phone whenever he can be of help. AMERICAN-STANDARD, KEWANEE BOILER DIVISION, 101 Franklin Street, Kewanee, Illinois.

Kewanee Boilers are advertised regularly in national publications.

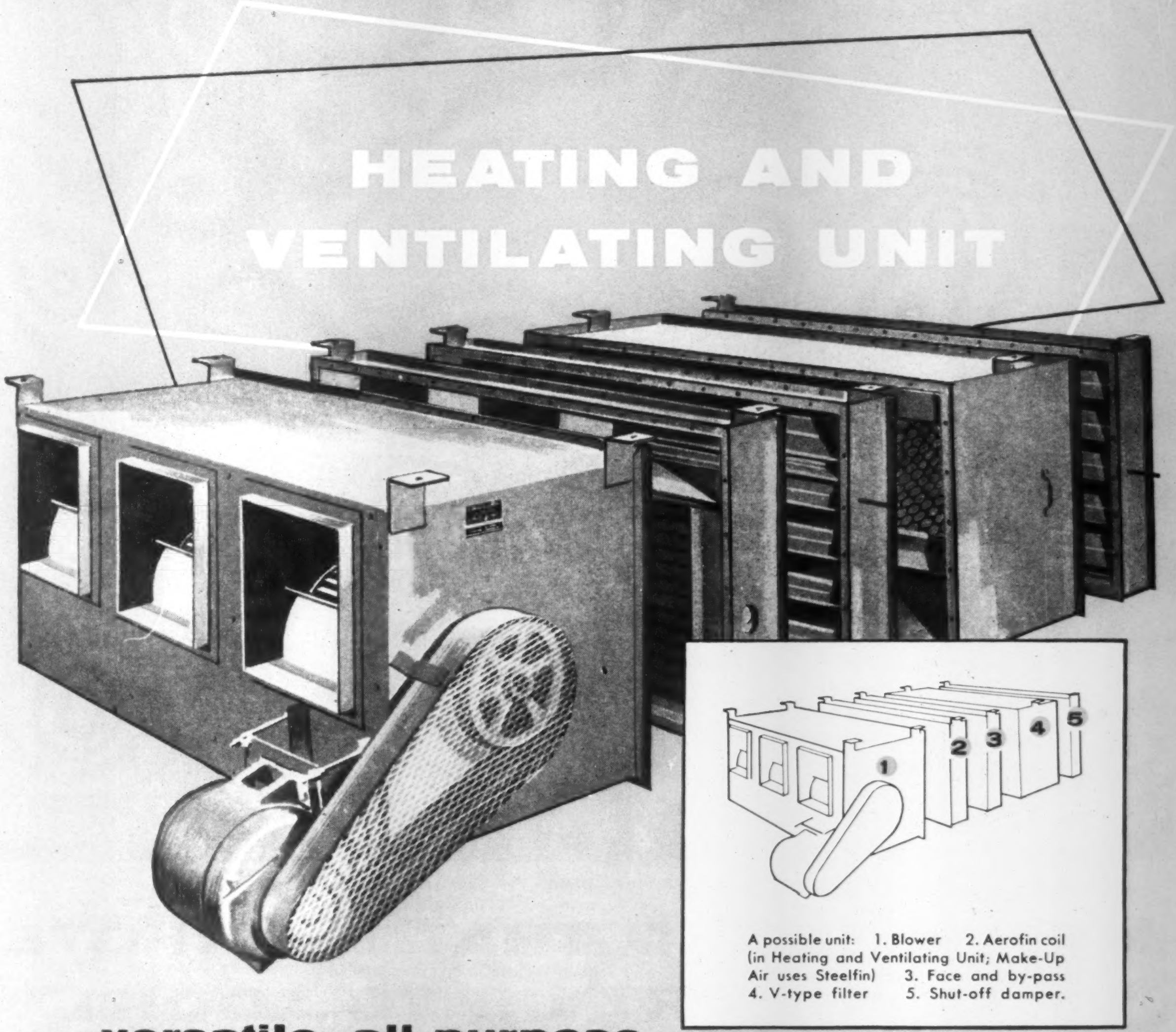
AMERICAN-Standard

KEWANEE BOILER DIVISION

. . . the Make-Up AIR family

proudly presents a new addition . . .

HEATING AND VENTILATING UNIT



A possible unit: 1. Blower 2. Aerofin coil (in Heating and Ventilating Unit; Make-Up Air uses Steelfin) 3. Face and by-pass 4. V-type filter 5. Shut-off damper.

. . . versatile, all-purpose

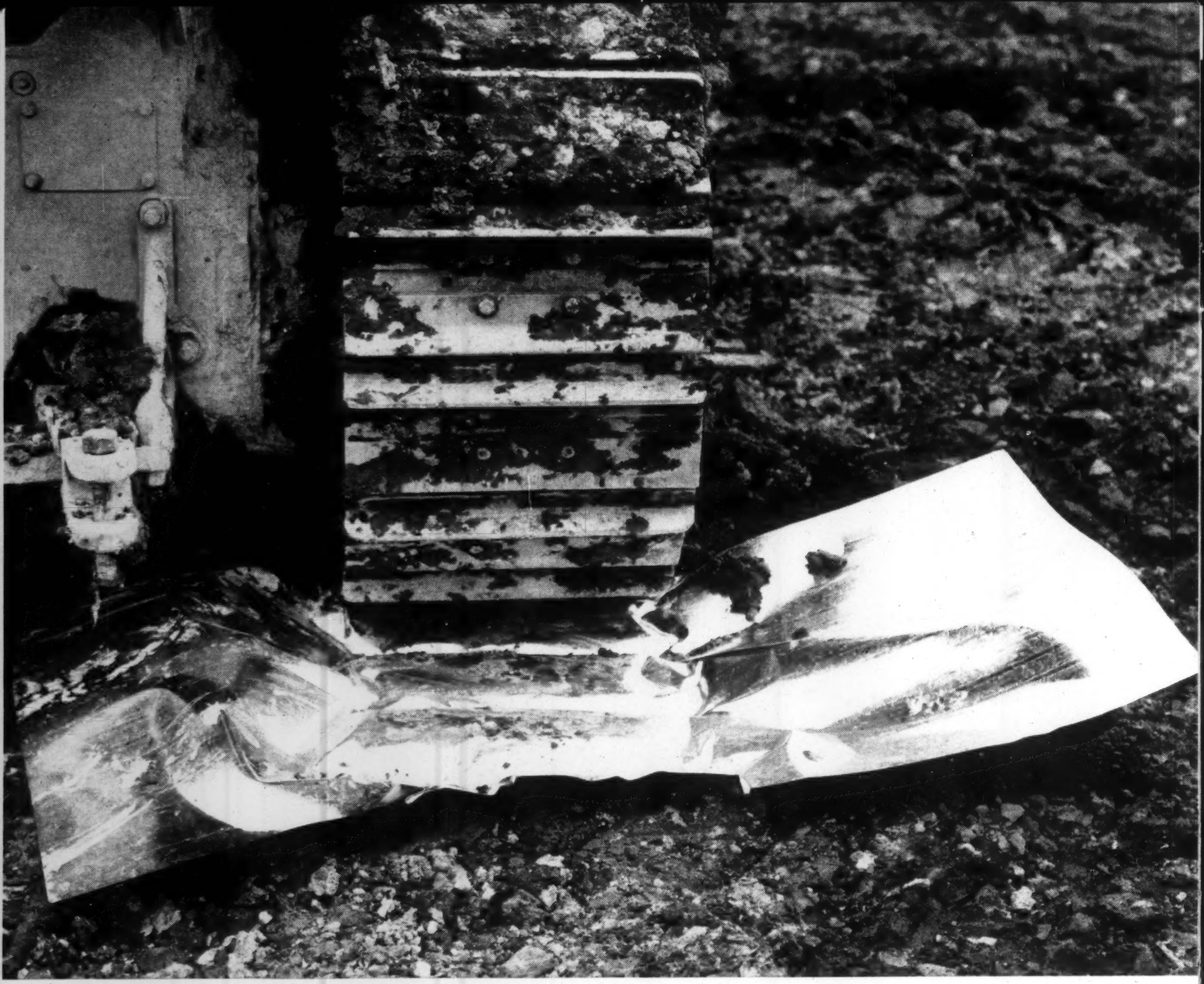
interchangeable components for Make-Up AIR

and general ventilation applications . . .

The Make-Up AIR, using Steelfin coil, now adds to its family a heating and ventilating unit, using Aerofin copper coil. All sections are individually supported, and are removable for maintenance or replacement. Nine basic blower sections are available, in any rotation. Write now for bulletin 567.

THE NEW YORK BLOWER COMPANY

SALES OFFICES: 3149 SOUTH SHIELDS AVENUE • CHICAGO 16



WE TORTURED THAT WEIRKOTE® TILL IT HURT US TO LOOK!

The heavy tractor's treads crunched into the Weirkote steel, rocked back and forth, gave Weirkote's tight zinc coating a wicked test.

It passed perfectly.

Weirkote shrugs off punishment like that—or far worse—in everyday production. Its continuous-process zinc coating goes through all the severe fabrication steps flawlessly—bending, deep drawing, crimping, twisting or lock seaming. There's no flaking or peeling when Weirkote's on the job.

Weirkote is continuous-process zinc-coated steel at its best—highly resistant to corrosion, heat and noise. And it mounts fast because it's rigid. Takes a lot of kicking around on the building site. Why not check on Weirkote today.

Free Weirkote Booklet!

Send for all the facts on Weirkote.
Write Weirton Steel Company,
Dept. M-5 Weirton, West Virginia.

WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY

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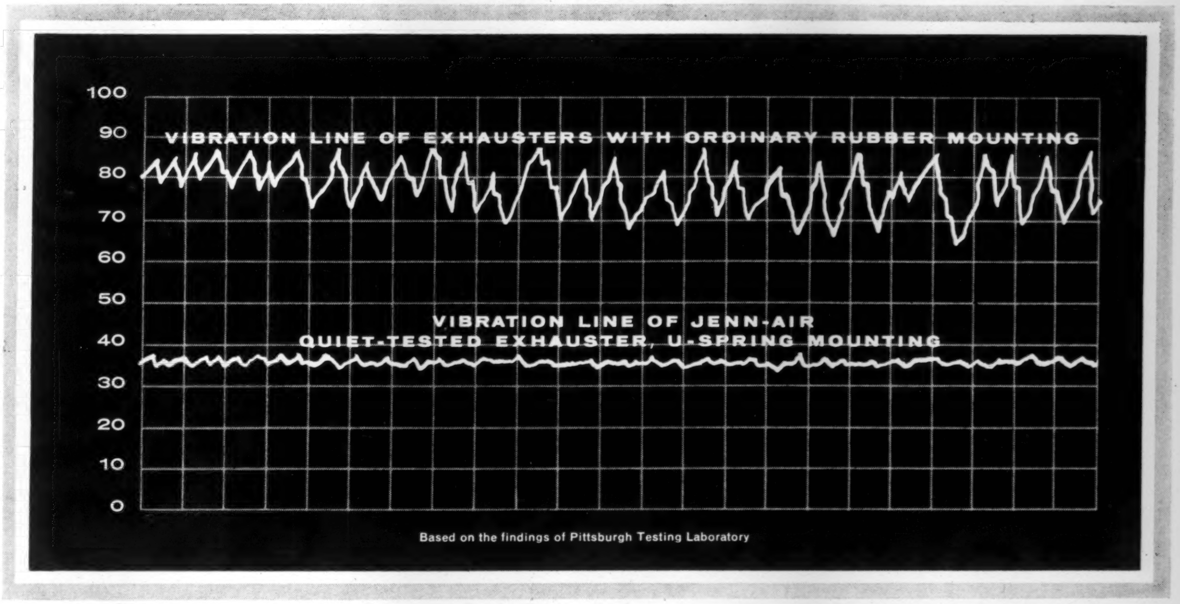
a division of

NATIONAL STEEL CORPORATION



Based on the findings of Pittsburgh Testing Laboratory

The above chart shows a comparison of vibration levels between ordinary exhausters and Jenn-Air Quiet-Tested Exhausters.

44% Less Vibration with JENN-AIR Quiet-tested Roof Exhausters!

Independent Laboratory Tests Prove Conclusively That Jenn-Air Quiet-Tested Roof Exhausters With U-Spring Suspension Show 44% Better Vibration Isolation Than Exhausters With Power Assembly Mounted in Rubber

Noise elimination is a problem which faces the ventilation industry today. To minimize the noise caused by vibration, Jenn-Air developed the Quiet-Tested Roof Exhauster with U-Spring cushion suspension. Now an independent laboratory offers proof positive this new principle of suspending the power assembly with U-Springs does the job. The PITTSBURGH TESTING LABORATORY, an independent research firm, was recently asked to compare Jenn-Air's Quiet-Tested Roof Exhauster, with U-Spring Suspension Mounting, against exhausters with ordinary rubber isolators. Tests were conducted under actual working conditions. Result: (see chart for dramatic evidence): *Jenn-Air Exhausters showed 44% less vibration transmission than the other exhausters.*

Jenn-Air Quiet-Tested Roof Exhauster, with U-Spring Cushion Suspension Mounting. Note low contour design which complements modern architectural lines.

U-SPRING CUSHION SUSPENSION MOUNTING REDUCES VIBRATION . . . NOISE LEVEL

This innovation is another important improvement by Jenn-Air. It ensures against the major operating vibration and noise being transmitted through the duct work and into the building. The stainless steel also assures you the permanency of this quiet operation. Jenn-Air—and only Jenn-Air—Quiet-Tested Exhausters are proved under simulated field conditions. Each unit must pass rigid inspection by the critical *Vibronic Eye* . . . is 'screened' in Jenn-Air's Sound-Elec Test Chamber to detect noise and vibration.

Patents Pending

JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive • Indianapolis, Indiana

JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive
Indianapolis 7, Indiana
HPAC
Gentlemen:
Please send me free catalog giving complete information on how Jenn-Air U-Spring Cushion Suspension Mounting cuts vibration, lowers noise level.

Name____

Title____

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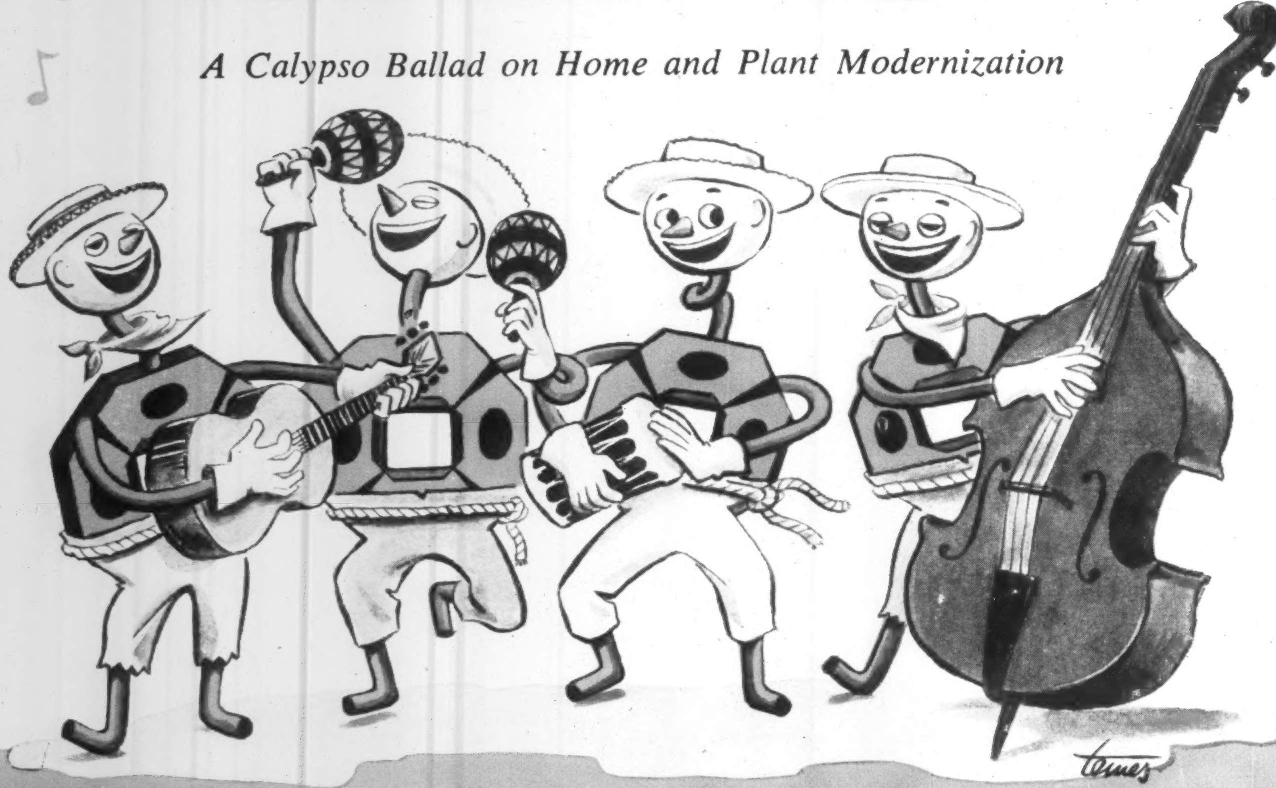
Address______________________________________

City____________________ State______________

What He Lacked Was Readi-Pakt

A Calypso Ballad on Home and Plant Modernization



There once was a contractor; sound advice he never heeded.
He specified no brand names when materials he needed.
With home and plant improvement orders he was sitting pretty
But his glaring lack of foresight is the subject of this ditty!

First, our trust-to-luck contractor hadn't specified the brand
Of the copper tube required for the jobs he had on hand.
The tube was slow in coming and the shipments reached him late
So his patrons tried to cancel when he missed each contract date.

When our trust-to-luck contractor checked the tube so long delayed,
He found that, in the shipments, several errors had been made:
The quantities, the sizes and the types were all confused
And his irritated customers, alas, were not amused.

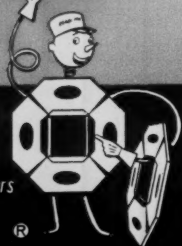
Rx Always Specify
READING COPPER TUBE
Dr. Readi-Pakt
SPECIALIST

Oh, scores of wise contractors make a point, when they contract,
Of passing their tube problems on to Dr. Readi-Pakt.
This copper tubing specialist most certainly will speed it;
He'll send exactly what you want, exactly when you need it.

READING COPPER BRASS TUBE

AND RED BRASS PIPE

MORAL: For peace of mind and for goodwill, ***be sure of where you're heading;***
In ordering your COPPER TUBE, ***play safe, insist on READING!***



READING Tube Corporation • Empire State Bldg., N. Y. 1, N. Y. • Plant: Reading, Pa

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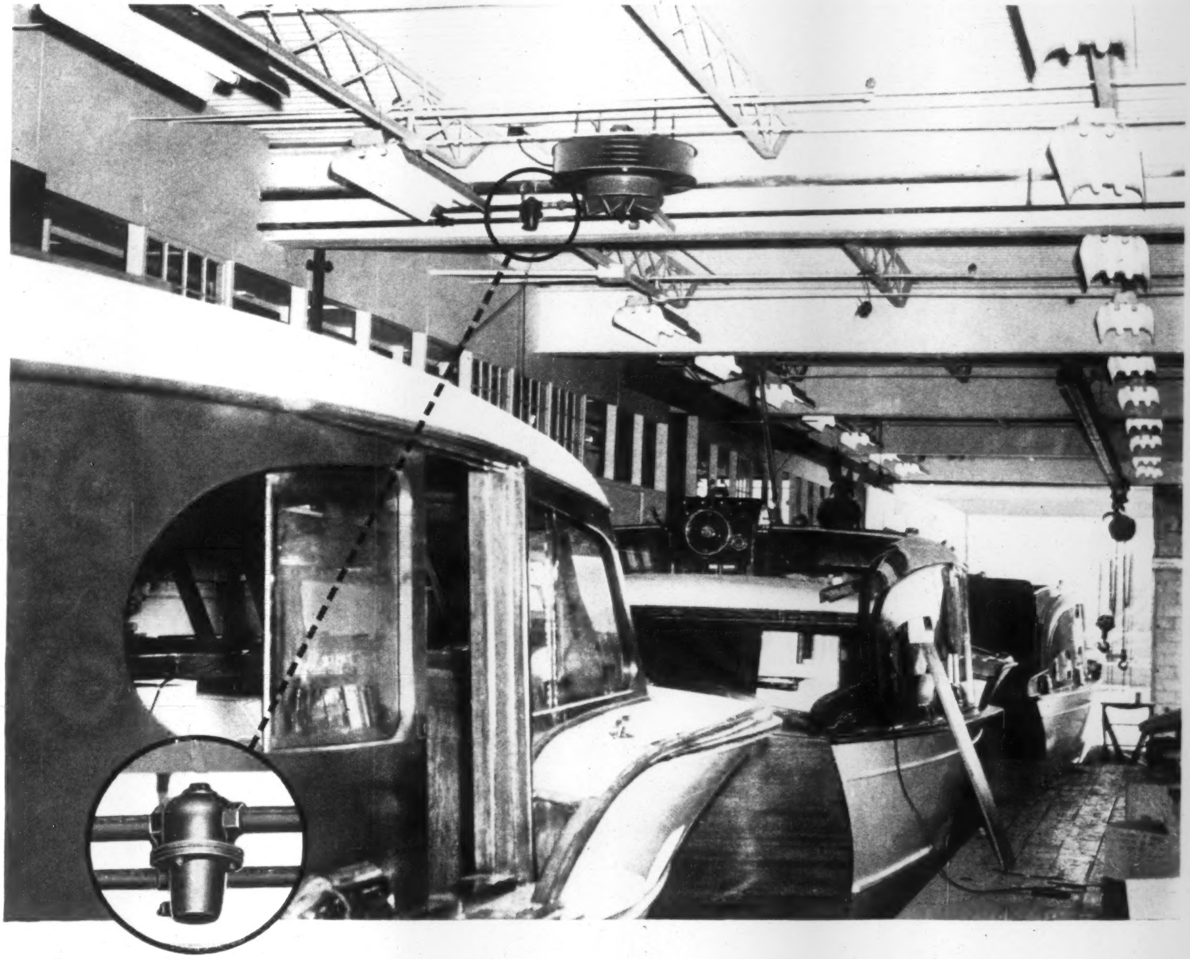
690 Murphy Ave.
S.W., Unit 5, Bldg. B



Do You Know of Any Other Steam Trap That Would Have Met This Requirement?

Here is one of nine production lines at Chris-Craft Corporation's Holland, Michigan plant. *Owners were insistent that no part of the building structure or its utilities should extend below the bottom flange of the ceiling beams.* That presented no problem for *Illinois* traps. Their unique design permitted in-line piping to Herman Nelson unit heaters (see inset) which left inches to spare! This guaranteed adequate headroom for boat masts and pulpits.

Also, Illinois traps had an outstanding durability record in prior Chris-Craft construction programs. Versatility and durability—two *good* reasons for specifying Illinois. Select from a complete line—25 inches vacuum to 600 lbs. pressure. Write for Bulletin 110.

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2035 S. Racine Ave., Chicago 8, Ill.
A Division of American Air Filter Company, Inc.

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Zone Control Systems

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Ducts lined with L·O·F Glass Fibers' Microtex are easy to fabricate and install; offer maximum insulation per dollar.

L·O·F Glass Fibers' Microtex duct liner gives 3-way protection, even at peak air velocities

For more efficient, 3-way insulation . . . under *all* operating conditions . . . at low cost, specify L·O·F Glass Fibers' Microtex duct liner. Fine glass fibers absorb mechanical noises; insulate warm- and cold-air ducts against heat transfer. Duct itself acts as a vapor barrier. Sprayed facing resists air erosion, even at top operating velocities.

Economical Microtex provides maximum insulation per dollar. Applied quickly with adhesive and formed with the duct in the brake, Microtex requires no special skills, tools or equipment. Can be easily cut and fitted into irregular sections. Available in 1½, 2, and 3 lb./cu. ft. densities, coated with black vinyl, Microtex is:

- strong
- permanent
- lightweight
- fire-resistant
- resilient
- pleasant to handle

Get the facts on high-efficiency, low-cost Microtex duct liner. Contact our distributor, or write: *L·O·F Glass Fibers Company, Dept. 39-57, 1810 Madison Avenue, Toledo 1, Ohio.*

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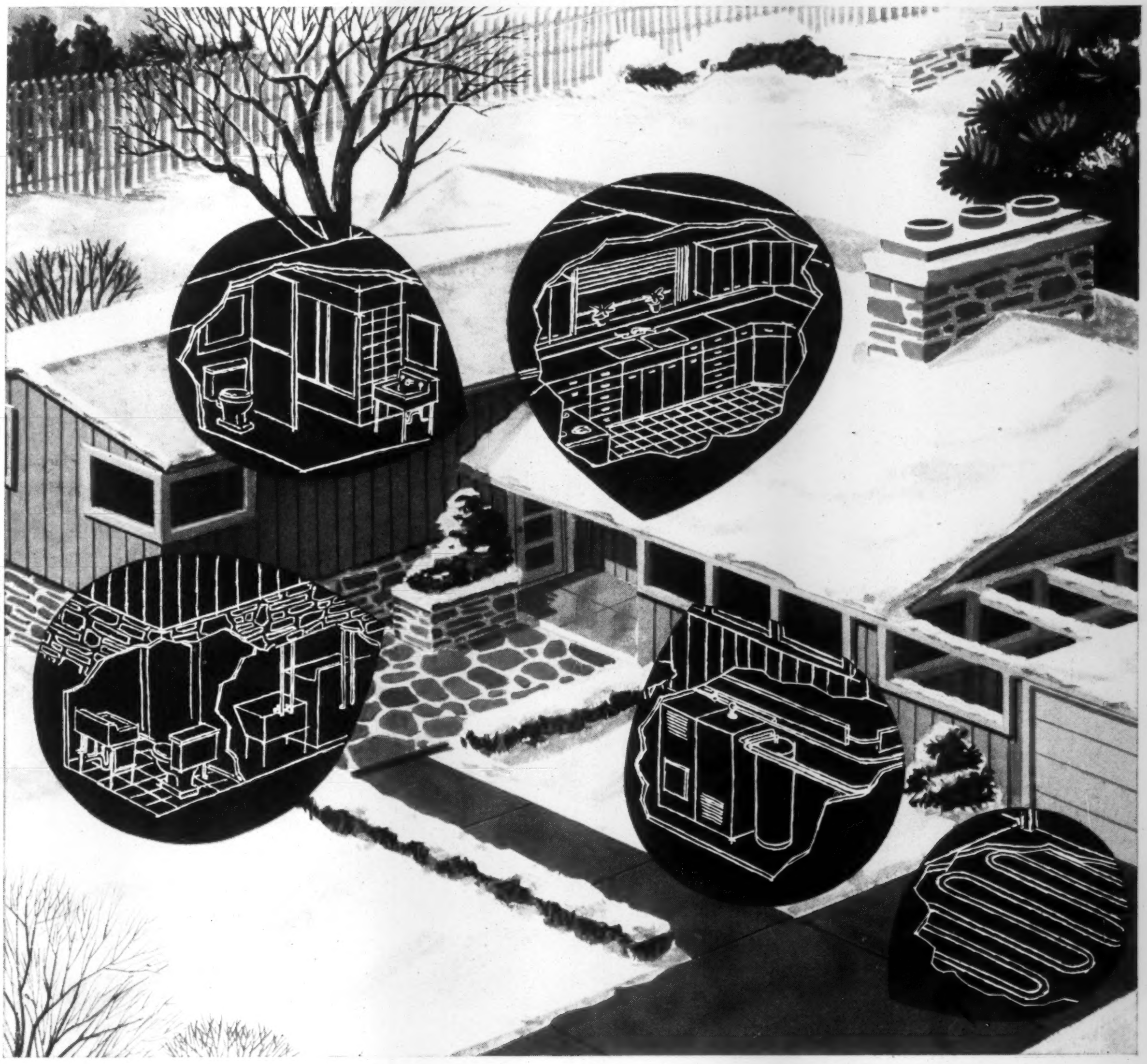


STEEL PIPE... vital arteries for modern living

Steel pipe is one of the most important metal products in our daily lives. Modern comforts and conveniences in the home depend on pipe. In industrial life, pipe is the arterial system for the lifeblood of power and energy.

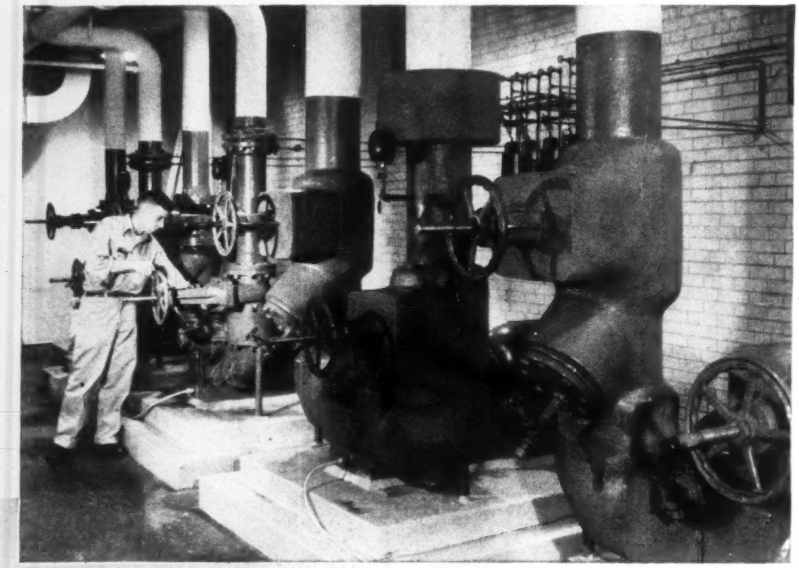
Jones & Laughlin is one of the world's principal suppliers of tubular products of highest serviceability. J&L controls *quality* all the way from raw materials through the finishing mills. Whenever you need superior pipe and dependable service, call your nearby J&L distributor. Or write to the Jones & Laughlin Steel Corporation, Dept. 519, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J L
STEEL

Jones & Laughlin

. . . a great name in steel

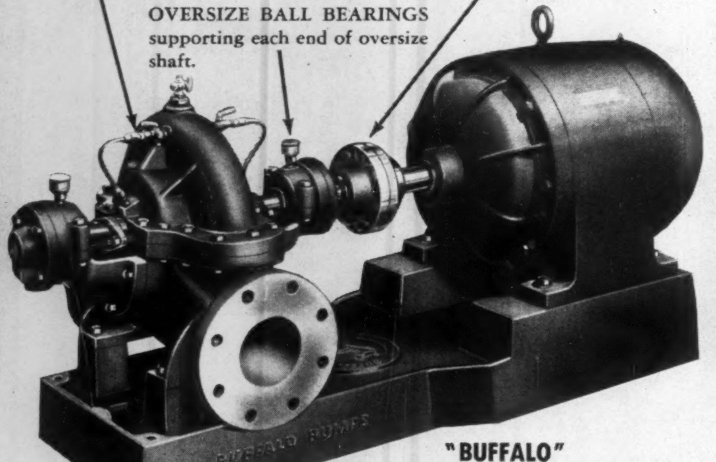
THE INSTALLATION CAN FUNCTION NO BETTER THAN ITS PUMPS—



AMPLE, HUSKY CASING has large, simply formed passages for minimum friction and hydraulic balance. Horizontally split for quick removal of upper half of casing without disturbing piping.

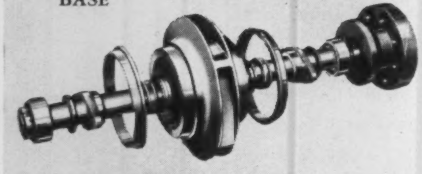
STURDY PIN-AND-RUBBER BUSHING COUPLING for flexibility and strength to carry maximum loads.

OVERSIZE BALL BEARINGS supporting each end of oversize shaft.



RIGID LIFETIME BASE

"BUFFALO" TYPE "SL" PUMPS FOR WATER SERVICE



IMPELLER AND SHAFT CONSTRUCTION has precision hydraulically balanced impeller of the most efficient enclosed design. Note bronze wearing rings, heavy duty bearings and large diameter shaft.

—WHY NOT PICK THE BEST?

The pump is generally the least costly item in a job like the above installation, supplying chilled water for air conditioning a large store — yet it's no place for pump troubles! The contractor took no chances. He specified "Buffalo" Double Suction.

A look at the "Buffalo" features at left will indicate what we mean by "best". Literally, from impeller to coupling, it incorporates the finest obtainable materials with the best hydraulic design of our 80 years in the business. The "Buffalo" engineering and manufacturing departments have "gone the limit" to make available to you a pump that will live up in every way to the excellence of your finest installations. Bulletin 955 gives full engineering details — write for your copy!

"Buffalo" PUMPS

BUFFALO PUMPS

DIVISION OF BUFFALO FORGE COMPANY

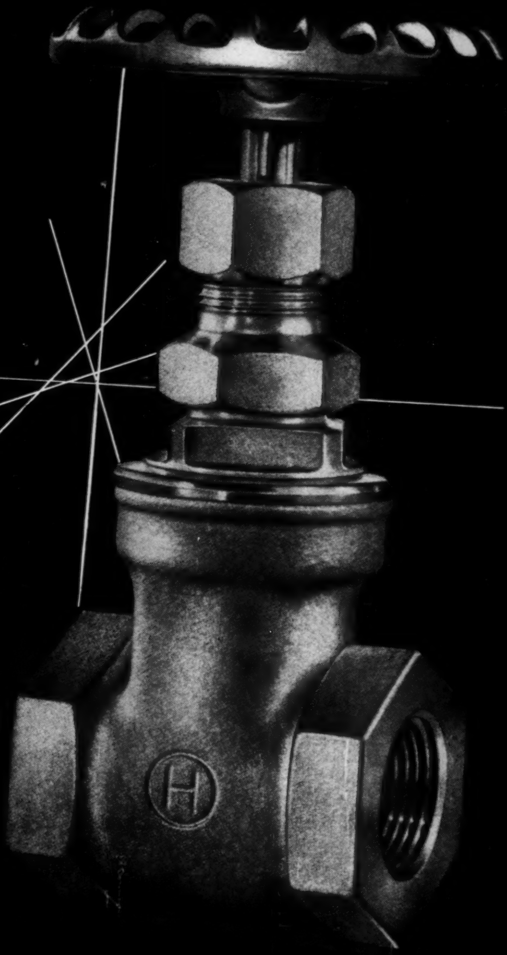
171 MORTIMER ST. • BUFFALO, N. Y.

Canada Pumps, Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

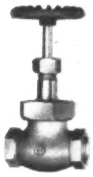
A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

Presenting...
the **HAMMOND**
heavy-duty
bronze valve line



Now the HAMMOND line includes a broad selection of heavy-duty bronze valves . . . produced to the same high quality standards that have made HAMMOND one of the leading manufacturers of domestic plumbing and heating valves. Each HAMMOND heavy-duty valve is fully tested and meets Federal specifications. Each is backed by HAMMOND's 46 years of experience making bronze valves exclusively. Specify HAMMOND whenever you need a heavy-duty bronze gate, globe, angle or check valve. Write for our condensed catalog No. 146 and comparable valve chart. Hammond Brass Works, Hammond, Indiana.

Some typical HAMMOND high-pressure valves



#413 Composition disc globe with union bonnet and slip-on type disc holder. To 150 lbs. of steam.

#412 Brass disc regrinding globe with union bonnet. To 300 lbs. of steam.

#610 Quick opening gate valve with cam-operated solid wedge disc. To 125 lbs. of steam.

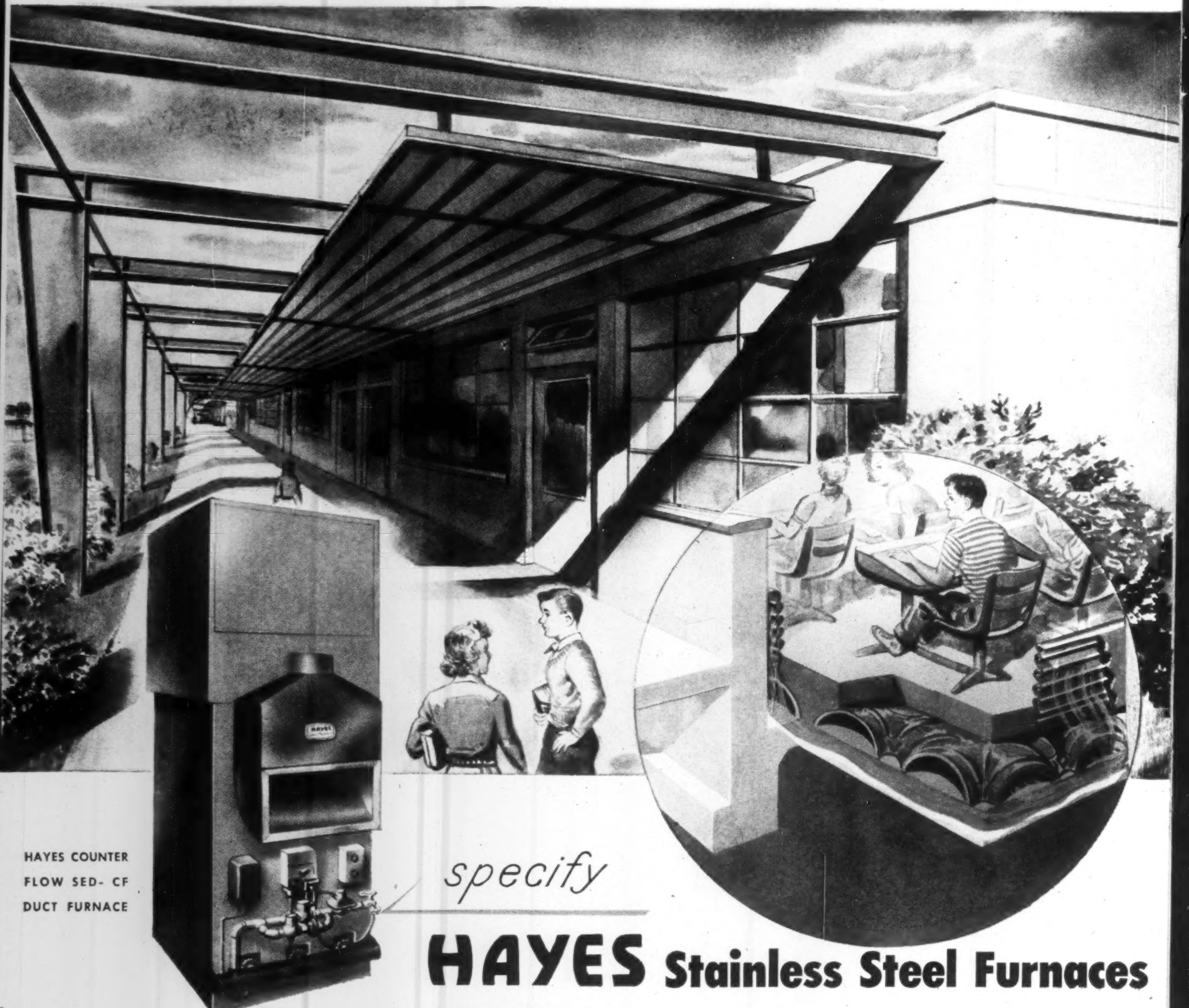
#619 N.R.S. gate valve with solid wedge disc. To 150 lbs. of steam.

See us in Booth 835 at the NAPC Convention

H **HAMMOND** *BRITE-KOTE*® **BRONZE VALVES**

MODERN SCHOOLS DEMAND WARM FLOORS

and ADEQUATE VENTILATION !



HAYES COUNTER
FLOW SED- CF
DUCT FURNACE

specify

HAYES Stainless Steel Furnaces

with AIRFLOOR type heating

HAYES counter flow furnaces were designed for better control of slab temperatures plus required ventilation, and efficiently handle the large air flow rates used on air heated floor applications. For further information request bulletin or inquire through HAYES representatives in all principal cities.

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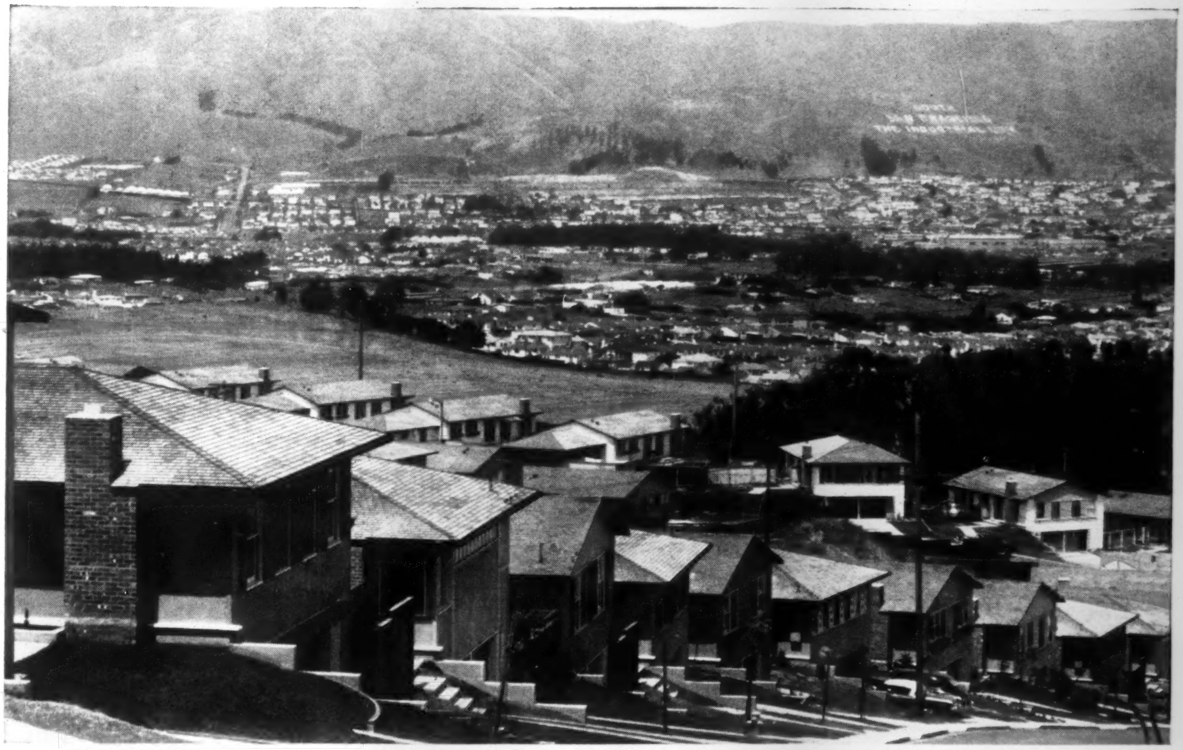


Rollingwood Estates, a new hillside development in San Bruno, Calif. *Plumbing and Heating Contractor:* W. L. Hickey Sons, Inc., San Bruno. *Jobber:* Grinnell Company of the Pacific, San Francisco.

Suburban Homes in California...Apartment Building in Maryland

Both Have Beth-Co-Weld Piping

Shown here are the Carrollton Apartments, a new 100-family structure in Baltimore, Md., and Rollingwood Estates, a 1600-unit suburban development in San Bruno, Calif., south of San Francisco. Each has hundreds of feet of Beth-Co-Weld steel pipe for plumbing and heating lines.

Carrollton Apartments, Baltimore, Md. *Plumbing and Heating Contractor:* Heer Bros., Inc., Baltimore. *Jobber:* Hajoca Corporation, Baltimore branch.

Beth-Co-Weld steel pipe is popular for plumbing and heating work because it's good, sound pipe, made from quality steel by the continuous-weld process. Contractors also like the economy Beth-Co-Weld makes possible, as it's such easy pipe to cut, thread and weld.

You'll find Beth-Co-Weld meets all your requirements for steel pipe. It comes in diameters from ½ in. to 4 in. in standard weight. In extra-strong weight it is furnished in diameters from ½ in. to 3 in. Both weights come in 21-ft lengths, plus or minus 1 in., and in random lengths. When buying pipe, ask for Beth-Co-Weld.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

The most important material of all!

Many items are going into the building of our new Sidney plant — steel, brick, cement, glass. But you cannot see the one element that makes the entire project possible — FAITH.

We have faith in the fine Copeland organization — from factory workers to our jobbers and dealers.

We have faith in the quality of Copeland products.

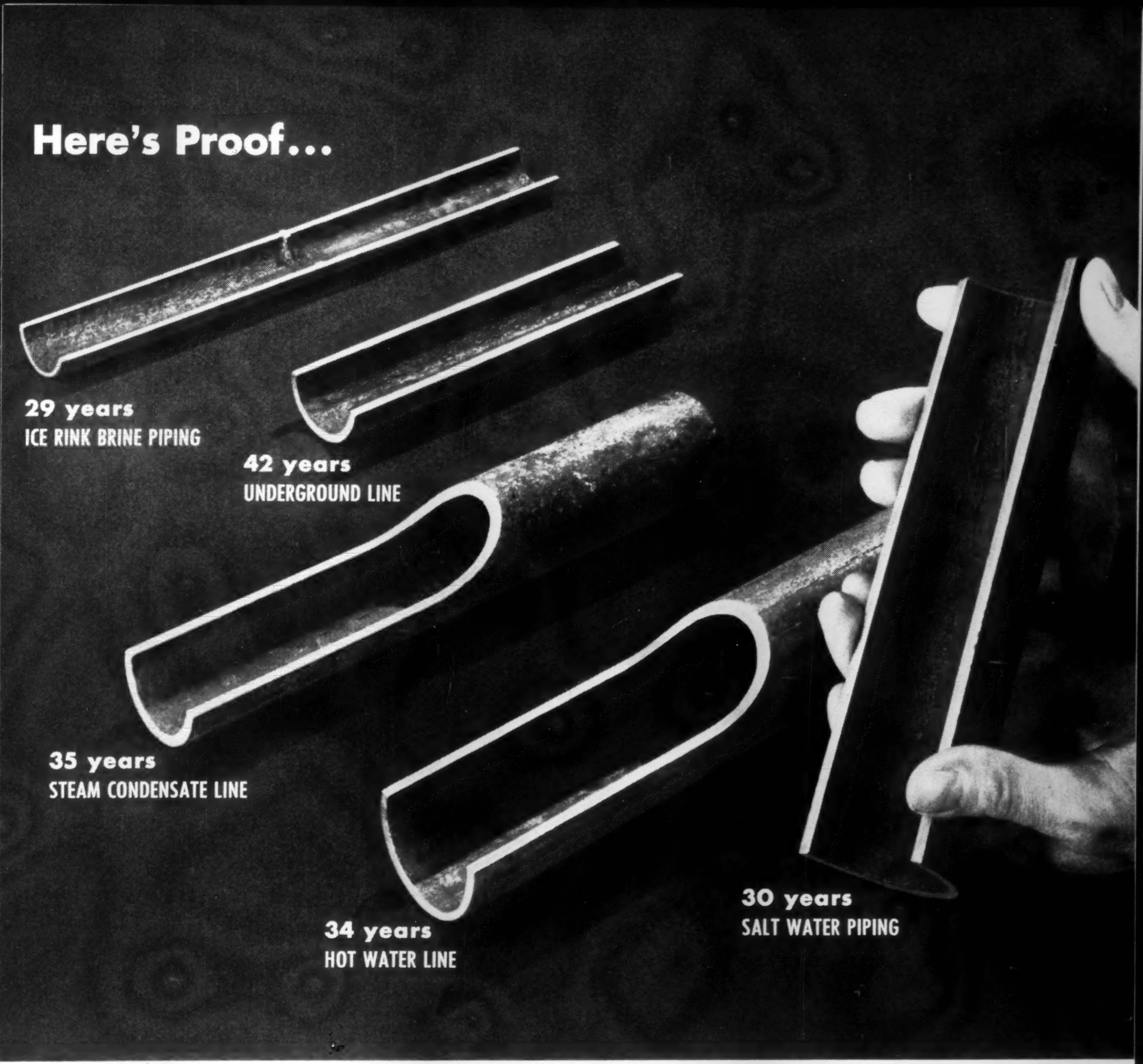
We have faith in the future of our industry, as the demand for refrigeration and air conditioning constantly increases.

We have faith in the growth of America and the system of free enterprise which has given us the highest standard of living in the world.

LIVE BETTER ELECTRICALLY

Manufacturer of the heart of America's finest commercial refrigeration and air conditioning

SINCE 1918
Copeland REFRIGERATION CORPORATION, Sidney, Ohio



Over 250,000 fibers of glasslike iron silicate guard each cross-sectional square inch of wrought iron pipe against corrosion

Wrought Iron Pipe pays off in years of service rendered

There's a practical, dependable way to evaluate a piping material's potential in corrosive service: check its performance under actual field conditions.

The photo above shows how wrought iron pipe measures up when this service-life yardstick is applied. Here you see actual samples taken from wrought iron pipe installations in a variety of corrosive services. Some of these sections came from buildings that were being torn down. Some were cut from in-use installations by our laboratory staff.

The reasons why wrought iron pipe has lasted so long and remained in such excellent condition are found in the material's structure and composition. Tiny fibers of glasslike iron silicate are threaded throughout the body of high-purity iron. These non-rusting fibers are highly resistant to corrosive attack. When corrosion strikes, these fibers halt and detour the attack, prevent rapid pitting and penetration.

Our bulletin, *Piping for Permanence*, presents in detail wrought iron pipe's case against corrosion. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Division Offices in Boston, New York, Philadelphia, Washington, Atlanta, Pittsburgh, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N.Y.

Available in Canada and throughout the world

BYERS Wrought Iron Tubular and Hot Rolled Products

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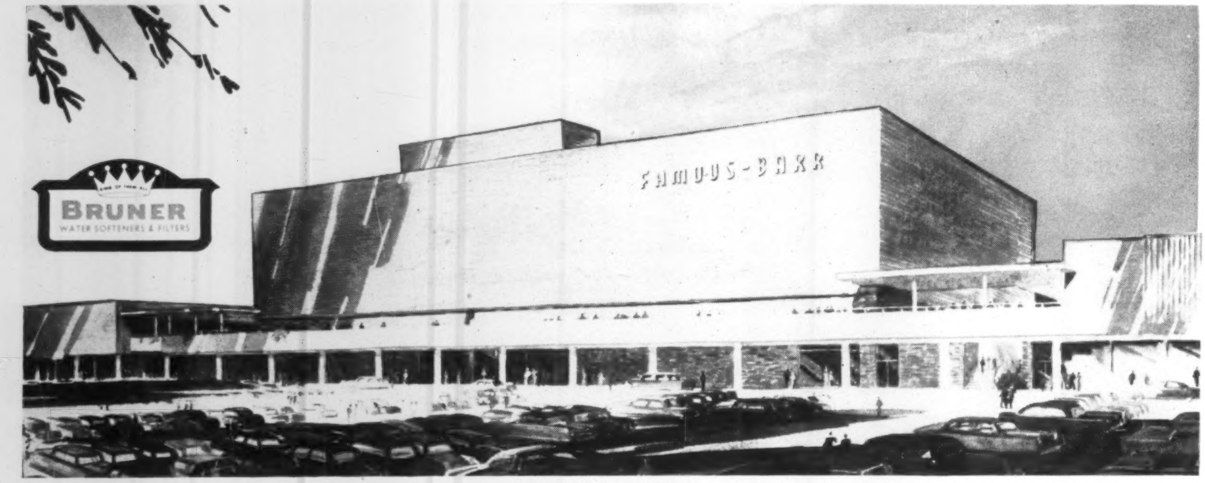
INDUSTRIAL WATER SOFTENERS



FAMOUS-BARR BUILDING A in Northland Shopping Center, at Jennings, near St. Louis, Mo.
Consulting Engineers: Ferris & Hamig, St. Louis, Mo.
Architect: Russell, Mullgardt, Schwarz & Van Hoefen, St. Louis, Mo.
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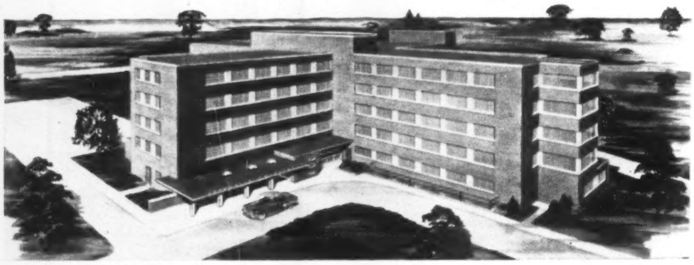
ARE FREQUENTLY *Specified* BY LEADING ENGINEERS FOR IMPORTANT INSTALLATIONS!



COMMUNITY HOSPITAL, Indianapolis, Ind.
Engineer: J. M. Rotz Engineering Co., Indianapolis, Ind.
Architect: Daggett, Naegele, Daggett, Inc., Indianapolis, Ind.
Plumbing Jobber: Crane Co., Indianapolis, Ind.
Plumbing Contractor: Freyn Bros., Indianapolis, Ind.

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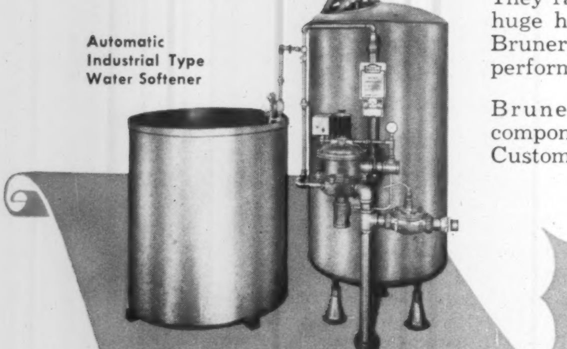
Bruner Industrial Water Softeners are meeting the needs of these important installations and in many other public and private buildings in all 48 states and seven foreign countries. They range from small laundries, schools, motels and resorts to huge hospitals, hotels, factories and atomic energy plants. Bruner is proud of its customer service — famous for product performance.

Bruner softeners, filters and other water conditioning components are available from stock in many types and sizes. Custom installations are fabricated to exact specifications.

Automatic Industrial Type Water Softener



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Plants: Milwaukee, Wisconsin, and Los Angeles, California
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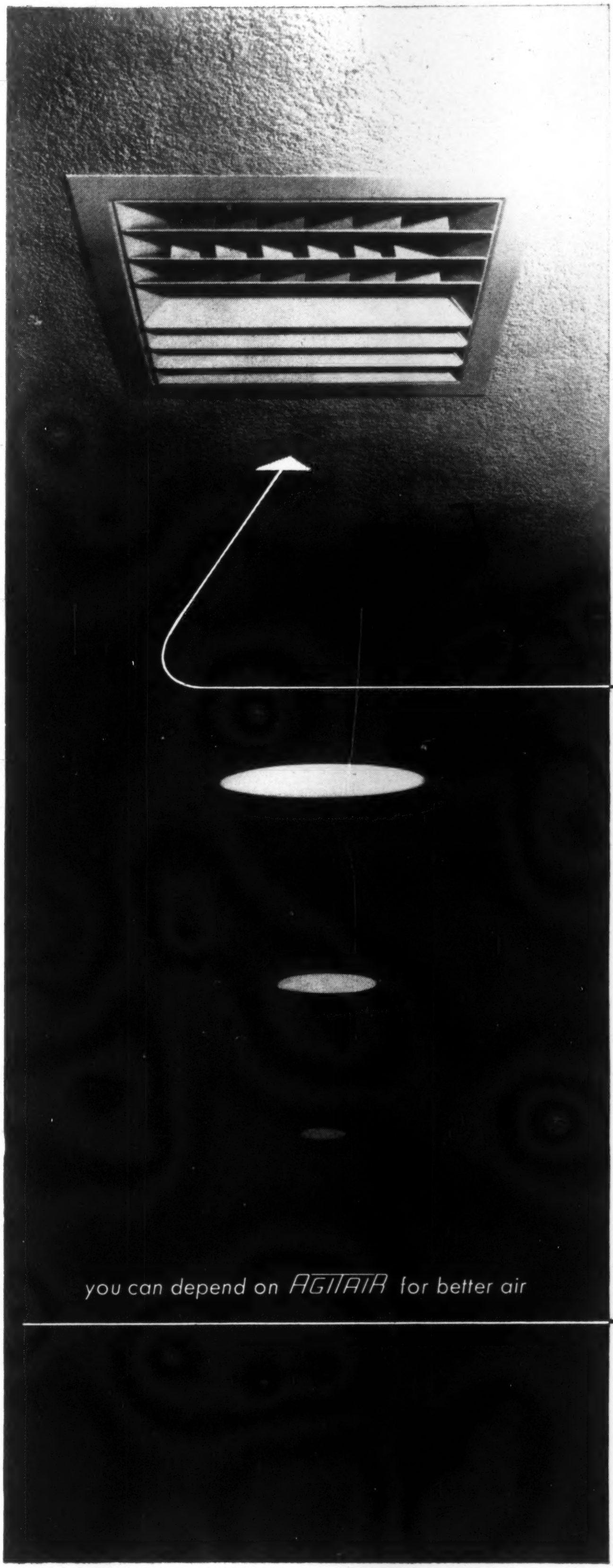

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AIR DIFFUSERS
with
DIFFUSING VANES

Each AGITAIR square and rectangular air diffuser is custom designed to meet your requirements of air flow and interior treatment.

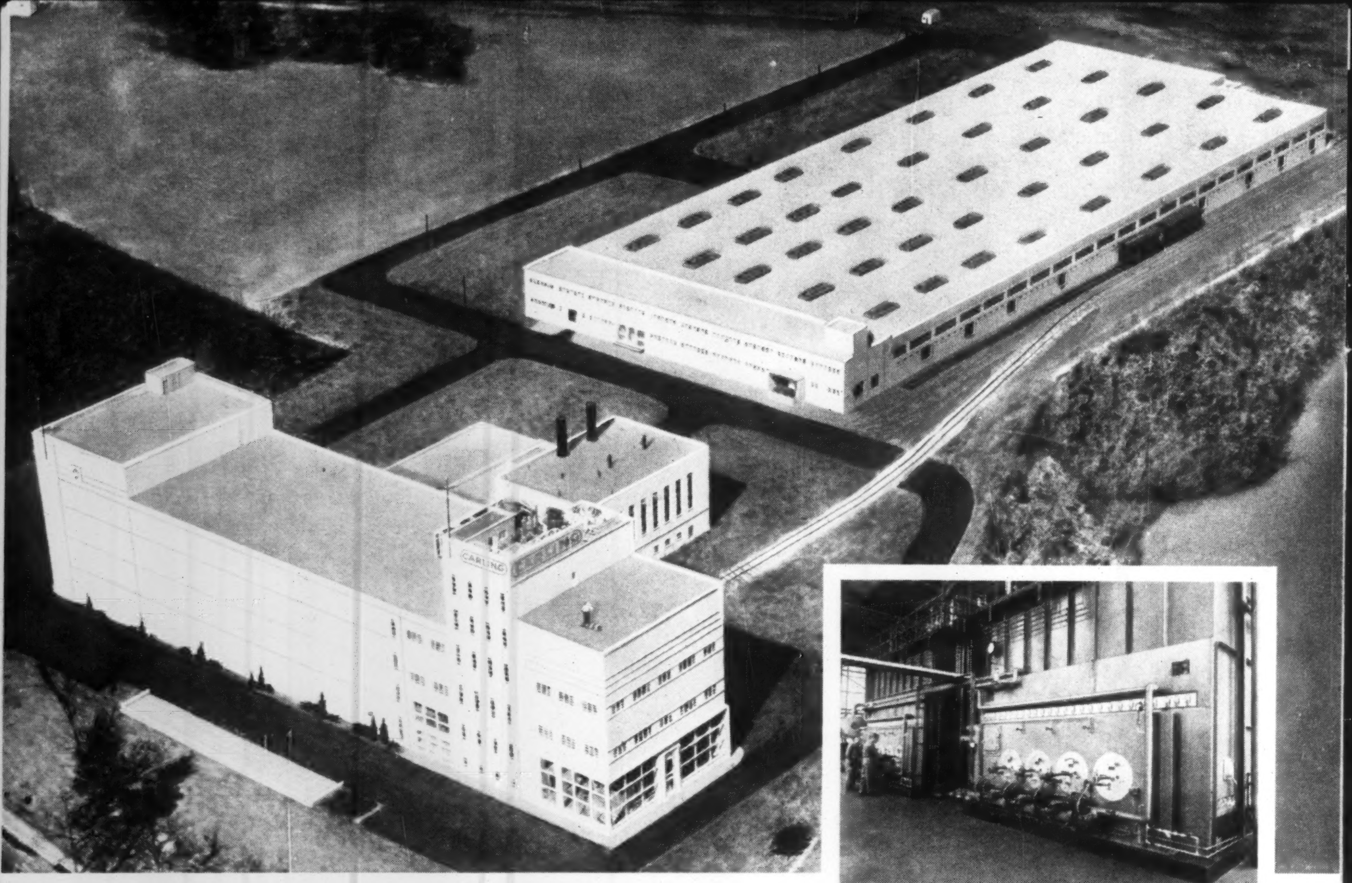
These AGITAIR diffusers have built-in diffusing vanes, scientifically arranged in unlimited louver patterns to provide certified 100% draftless air distribution from any ceiling or wall location.

AGITAIR Catalog R-107 shows you how to select the proper size and pattern for your job conditions.

Write for your copy today.

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.
air diffusers • filters • exhausters



Each B&W Integral-Furnace Boiler at Carling's Natick plant has a capacity of 58,000 lb of steam per hr at operating pressure of 150 psi and 200 psi design pressure. Plant designed by: Carling Brewing Company, Engineering Department, Cleveland. Architect: John Marshall, Canadian Breweries, Ltd., Toronto. General Contractor: Gilbane Building Co., Providence, R. I.

B&W Integral-Furnace Boilers Prove Reliability at Carling's

TWO UNITS ASSURE CRITICAL TIME CYCLING IN BREWING PROCESS

Carling Brewing Company's Natick, Mass., plant, the first new brewery in New England in more than 40 years, produces 600,000 barrels of Red Cap Ale and Black Label Beer a year. Steam for the brewing process, pasteurizing, sterilizing, and heating the plant is supplied by two B&W Integral-Furnace Boilers.

One Unit Alone is meeting the plant's maximum load of 35,000 lb of steam per hr, with the second on a stand-by basis. This boiler-room schedule is part of the plant's overall design, which will permit adding another 600,000 barrels of capacity when required.

After a Year of Operation, Lewis R. Grant, Chief Engineer, reports that the oil-fired boilers have given instantaneous response to load changes and are operating at high efficiency. There has been no maintenance necessary since the boilers went on the line.

Reliability Is Important at the Natick plant because of the exacting time cycling of the brewing process. The B&W units have easily met this test. The steam delivered has been clean and dry, with no indication of solids carry-over.

B&W Integral-Furnace Boilers, for any steam requirements up to 350,000 lb per hr and for all fuel conditions, incorporate installation, operating, and maintenance features that give greater boiler efficiency, availability, continuity of service, and overall economy. They provide maximum capacity in small space, high fuel economy, smokeless combustion, and economical, fast steaming. Completely integrated units, they are backed by the undivided responsibility of a single manufacturer, with nearly a century of steam generating experience. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

G-839-IB

BABCOCK & WILCOX

B&W

BOILER DIVISION

1957 Construction May Top $64 Billion

. . . . *if credit conditions favor*

SMASHING dollar volume records for the 11th consecutive year, construction activity in 1956 totaled an estimated $60.6 billion in the continental U. S., and the potential indicated at the end of the year was for more than $64 billion in 1957, according to The Associated General Contractors of America.

The 1956 total of more than $44.1 billion in new construction and $16.5 billion in maintenance and repair of existing facilities represented an increase of about 3 percent over the spectacular construction year 1955.

The association estimates for 1957 $47.4 billion for new construction and $17 billion in maintenance and repair work in the continental U. S. It is stressed, however, that if progressively tightening credit conditions persist in 1957, this potential probably will not be realized.

The $44.1 billion volume of new construction in 1956 consisted of $30.7 billion in private construction and $13.4 billion in public activity, and was characterized by dramatic increases in nonresidential work, more than offsetting an 8 percent decline in residential dollar volume.

While private volume, depressed by housing, increased by only 1 percent in the aggregate, nonresidential building rose 15 percent to a total of $8.8 billion, paced by a 10 percent increase in commercial construction at $3.3 billion, and a 25 percent jump in industrial building, totaling $3.1 billion.

Increases were noted in religious, educational, and social and recreational projects, with only farm construction and hospital and institutional building declining.

The major component of private construction, public utilities, continued to expand, with outlays rising 10 percent to a total of $5.1 billion. Notable were increases of 16 percent by railroads, 20 percent by the telephone and telegraph industry, 10 percent by gas interests, 6 percent by the electric light and power industry, and 8 percent in pipe lines.

Public school outlays expanded 5 percent to $2.6 billion, accounting for an estimated 63,000 classrooms.

Military construction increased 9 percent to $1.4 billion. Industrial building—primarily atomic energy facilities—continued a drastic decline, falling 40 percent behind 1955 to $425 million.

Industrial construction is expected to continue its increase from current peak levels—but at a more moderate pace of about 14 percent, to an estimated total of $3.5 billion.

The construction of office buildings, including a number of skyscrapers, is assuming a more important role, and probably will account for a substantial part of 6 percent increase to about $3.5 billion. The construction of service and shopping facilities for new residential communities is expected to continue at near peak levels.

Privately owned public utilities, which experienced an unexpected increase of nearly $500 million in 1956, are scheduling new advances in outlays in 1957, which are expected to be in the magnitude of about 14 percent, for a total of $5.8 billion.

Religious construction, which fell below expectations in 1956, is expected to rise by 16 percent to $900 million, and moderate increases are expected in social, recreational, hospital, and institutional, and miscellaneous other private projects.

The downward trend of federal construction expenditures is expected to reverse, with rises of 7 percent in military construction to $1.5 billion. Public industrial construction, principally atomic energy facilities, is expected to remain at its current level of $425 million annually. The total federal share of public construction may reach about $4.1 billion, compared with $3.8 billion in 1956.

Public educational construction may increase 13 percent to about $2.9 billion under pressure for new classrooms to accommodate rapidly expanding school enrollments, irrespective of any federal aid legislation that may be enacted. About 63,000 public school classrooms are expected to be built in the 1956-57 school year, and the volume may reach 70,000 for the first time in 1957-58. ǂ

Childs & Smith Get Award For ADA Building Work

. . . article in February HPAC

CHILDS & SMITH, architects and engineers, were given an honor award last month for the alteration and rehabilitation of the American Dental Association building in Chicago, and a bronze plaque was presented the ADA.

The awards, selected by a jury headed by Sigurd Naess, of Naess & Murphy, architects and engineers, were made at an annual "civic pride" luncheon sponsored by the Chicago Association of Commerce and the Chicago chapter of the American Institute of Architects.

The double duct high velocity air conditioning system for the ADA building was described in an article by James H. Stiggleman, chief mechanical engineer for Childs & Smith, in an article in the February issue of HPAC. ǂ

Construction Contracts Drop 3 Percent

. . . in February

CONSTRUCTION CONTRACTS in the U.S. in February totaled $2,161,009,000, a decline of 3 percent below February of last year, according to F. W. Dodge Corp. This decline offset a small increase in January, so that the first two months together show no change from the same period of 1956.

The decline in February was entirely accounted for by the private ownership part of construction. Contracts for publicly owned projects increased substantially. These contracts accounted for 39 percent of the total in February 1957, as compared with only 33 percent in February 1956.

Residential contracts in February — $875,486,000 — declined 7 percent below the same month last year.

Nonresidential building contracts in February totaled $820,038,000, an increase of 10 percent over February of last year. Manufacturing and commercial building categories declined, both by 7 percent, but all other major nonresidential building types increased.

Contracts for heavy engineering categories amounted to $465,485,000, down 13 percent from February last year. This decrease was the combined result of a sharp drop in public works contracts, partly offset by a sharp increase in public utilities.

Figures for the first two months of 1957, with percent increase or decrease from the same period of 1956, are as follows: nonresidential building, $1,734,206,000, up 13 percent; residential building, $1,692,052,000, down 4 percent; heavy engineering, $1,034,305,000, down 11 percent; and total construction, $4,460,563,000, approximately the same as last year. ‡

Compressor Shipments Gain 32 Percent

. . . in 1956

MANUFACTURERS' shipments of compressor bodies reported for the calendar year 1956 totaled 4,775,843 units, not including compressors for household refrigerators, a gain of more than 32 percent over 1955 shipments, according to Geo. S. Jones, Jr., managing director of the Air-Conditioning and Refrigeration Institute.

Of the 1956 total, 284,022 compressors were for automotive air conditioning, compared with reported shipments for the year 1955 of 255,371 automotive units.

Figures for compressor bodies 1 hp and above shipped in 1956 are as follows:

Horsepower	Units
1	933,646
1½	393,213
2	70,118
3	110,408
5	89,143
7½	44,707
10	9,849
15	3,862
20	2,997
25	1,878
30	7,119
For ammonia refrigerant	1,966

‡

2000 Ton System To Condition Illuminating Bldg

. . . high sun, lighting loads

THE FIRST new major downtown office building in Cleveland in the last 25 years, the 22 story Illuminating building, will utilize 2000 tons of air conditioning, according to The Trane Co.

With over 400,000 sq ft, the building will be the city's third largest public office structure and will cost over $17 million.

Incorporating 100 percent glass and aluminum facade, open floor plan, and high light load, the building presented rather formidable, yet typical, air conditioning problems.

Running vertically throughout the 22 story height is a center core service area — including interior zone air conditioning system ducts and related equipment — surrounded on each floor by office space, all adjacent to the outside glass.

The two story ground floor lobbies also will be enclosed in a continuous glass facade.

A high pressure conduit induction air system serves the perimeter zones, and a low pressure single duct distribution system serves interior zones.

Principal components of the system include two hermetic centrifugal compressors rated at 1200 and 500 hp and capable of delivering 2000 tons of cooling capacity.

About 1500 induction air handling units will be beneath windows. With the exception of the sixth floor, the units will be furred in to blend with the decor of the interior.

The compressors will be in the basement, with additional equipment in the 23rd floor penthouse. The building has been divided into two specific sections, with two primary air handling units in the basement serving the first 11 floors and two in the penthouse serving the top 11 floors. These primary air units, with fans and cooling coils, in total will provide about 144,000 cfm of cooled air for the exterior zones with, of course, the compressors providing the chilled water for the entire system.

The building is expected to be ready for occupancy by September. Carson and Lundin are the architects. McGeorge, Hargett, & Associates are the consulting engineers, with Jaros, Baum & Bolles associate consultants. The heating, piping, and air conditioning contractor is Kerby Saunders, Inc. ‡

"Quote"

"The foreseeable fantastic world energy demands, and limited stored energy sources, may make fluid coal the nation's dominant fuel by the turn of the century."—*Professor R. C. Jordan, head of the mechanical engineering department, University of Minnesota, at the recent American Power Conference in Chicago.*

WEBSTER TRU-PERIMETER

Forced Hot Water BASEBOARD HEATING

. . . all-new for 1957 . . . *proved and improved!*

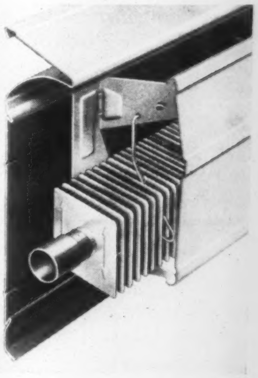
Now Webster Baseboard Heating is better than ever . . . and at a new, lower price!

Ten years ago Webster pioneered in the baseboard heating field with the world's first Tru-Perimeter Heating. Today . . . with those basic principles unchanged . . . Webster presents a new non-ferrous Baseboard Heating that teams its time-tested, performance-proved features with a new improved design and construction.

Here's 1957's smoothest highway to home heating comfort! Here's all the beauty of earlier Webster Baseboard, plus new production economies for lower first cost . . . and easier, more economical installation. And for summer comfort, include the completely independent — completely compatible — Webster Cool Air System, with ducts designed for cooling only. Separate controls for heating and cooling.

For your next residential installation, start your planning with Webster's Finest Product — the Warren Webster Man. Call him . . . or write for Baseboard Bulletin C-680, or Cool Air Bulletin B-2011.

Warren Webster & Company, Camden 5, N. J. Since 1888. Offices in 67 principal U. S. cities and Canada.

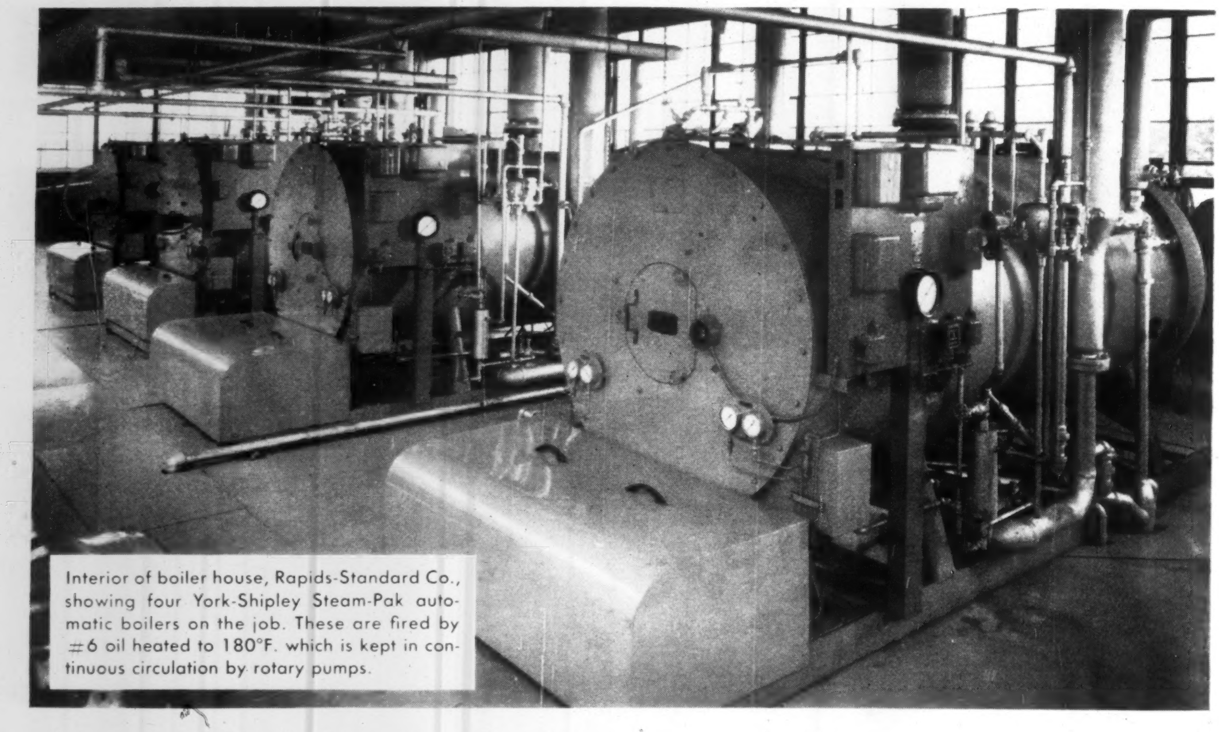


In Webster Baseboard Heating, air enters at floor line, passes over heating element, is warmed and comes out at top of baseboard enclosure. Baseboard extends only 2⅞ inches beyond plaster line.

Webster's Finest Product . . . the Warren Webster Man

WARREN WEBSTER

HEATING . . . COOLING



Interior of boiler house, Rapids-Standard Co., showing four York-Shipley Steam-Pak automatic boilers on the job. These are fired by #6 oil heated to 180°F. which is kept in continuous circulation by rotary pumps.

They're saving money today . . . and looking after tomorrow, too !

How York-Power Steam-Paks more than doubled heating output . . . with no increase in building costs.

For more than eight years, two YORK-POWER Steam-Paks had been supplying ample heat for the Rapids-Standard Company in their Plymouth, Michigan plant.

The efficiency and economy records of these boilers were so high that when the time came to double plant facilities, company engineers realized they could do no better than to add two more Steam-Paks to take care of increased heating needs.

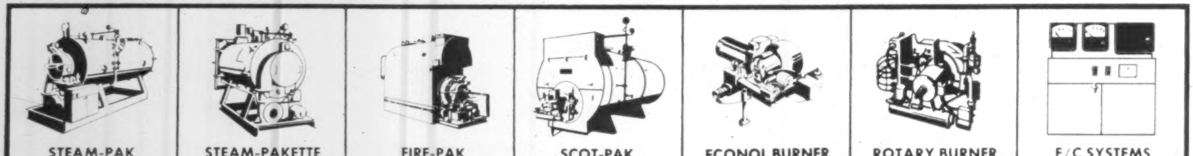
"From our particular view point," said Mr. Russell A. Inwood, Vice President of Engineering and Manufacturing, "the flexibility which YORK-POWER Steam-Paks provided for continuous expansion was of greatest importance. Also, because there were no expensive chimneys or foundations to construct, and because the units were pre-wired and pre-piped, we could cut down on installation costs."

SAVED BUILDING COSTS. Merely by rearranging the floor plan of the over-size boiler house, it was found that two more Steam-Paks could be set up . . . with *no extra building costs.* These four units now take care of all present heating needs and also provide for continued expansion for many years to come.

Find out how YORK-POWER Steam-Paks can help you. Our engineers are available to give full cooperation. Specification sheets and detailed data are yours for the asking. Write TODAY.

Industrial Division **YORK-SHIPLEY, Inc.** **YORK, PENNSYLVANIA**

ONLY YORK-POWER OFFERS A COMPLETE LINE OF AUTOMATIC BOILERS, BURNERS, AND FUEL BURNING SYSTEMS



STEAM-PAK	**STEAM-PAKETTE**	**FIRE-PAK**	**SCOT-PAK**	**ECONOL BURNER**	**ROTARY BURNER**	**F/C SYSTEMS**
15 to 600 Hp. Oil and/or Gas Firing	10 to 50 Hp. Oil and/or Gas Firing	35 to 485 Hp. Oil and/or Gas Firing	52 to 400 Hp. Oil and/or Gas Firing	5 to 28 G. P. H. Oil Firing	18 to 400 Hp. Oil and/or Gas Firing	Automatic Fuel Burning Systems

"Open for Discussion"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Sees School Electric Heating Article "Misleading" in Points

I HAVE JUST READ with much interest the article *Heat Schools Electrically?* by Robert Lee Boyd in the December 1956 HPAC.

The information contained in this article will provide another source of information on electric heating systems, which are being given careful consideration. However, some of the information in the article seems misleading, in my opinion, and would result in inaccurate conclusions, I believe.

The comparison of the cost of the initial installation of the electric heating system installed and a comparable oil fired system is not mentioned. This is a rather important factor in these times when additional teaching space is so much in need.

The author refers to the night setback feature of the electric heating system in such a manner as to infer that such a refinement is not available with a heating system using any other fuel. The "no-fan night operation" type of unit is a common feature of the heating systems in this region where the largest number of systems are gas fired, using steam or hot water as the heating medium.

The article further leads one to believe that the heat storage factor of the building has no effect upon the amount of electric heat required.

Mr. Boyd arrives at a final estimated cost of the electric system as $2000-$2400 per year, based on actual hours of operation, in lieu of $9262.70, the cost for a full heating season operation of 5600 deg days. He then states that "some saving would be realized" with an oil fired system but does not point out what this saving would be.

Before revealing the actual cost of heating electrically, the author further leads the reader to believe that heat load credits for people and lights apply only if this type of system is installed.

In summation, an actual cost of $2669.60 is the bill for the first season's operation, which is represented as being a direct result of the high efficiency of electric resistance heating. This high efficiency at the point of use is available because the inefficiencies of fossil fuels were absorbed at the generating station.

Finally, I do not agree that we can afford to heat electrically, at a cost in this instance, in excess of $1000 per year while the country is in dire need of hundreds of classrooms.

JAMES M. PURDY
Blum and Guerrero
Consulting Engineers
Austin, Texas

THE AUTHOR'S REPLY—Mr. Purdy's interest in the article and in school heating in general is appreciated.

The occasion for most of his comments stems from the necessity of limiting the length of an article due to lack of space.

The architect estimates between $40,000 and $60,000 was saved in initial construction costs. This is reported in *Electric Unit Heaters Cut Cost of School* by T. A. McConnaughey, architect, in the December 1955 HPAC, and in *School Heated by Electricity*, by James A. Melone, in the March 1956 Qualified Contractor. On school bonds at 3 percent—low for today—this would justify about $1500 extra cost for fuel based on interest alone, with no reduction on the principal. On the new rate, the energy consumption for last year would cost about $530 less. In addition, the school board counted on savings in attendants and maintenance labor, and it is believed they have not been disappointed.

The "no-fan night operation" is relatively unusual in states having codes regulating ventilation requirements for schools. It is probably not uncommon in states such as Texas with no school codes.

There has been no attempt to disparage or analyze other means of heating, as there are many who are better qualified for such analysis than I am. It is unfortunate if implications were drawn from my article that night setback, heat storage of the building, and internal heat sources affect only the electric system. Each would affect any heating system but possibly to a different extent.

The main point of the article is that against an analysis of electric heating cost frequently used in preliminary studies showing $9263 per year, I proposed a method of calculation which indicated that the results would be closer to $2762 per year. Actual costs were $2670 the first year and are expected to fall much lower in subsequent years.

Despite the fact that the high efficiency of electric heating may be attributed to inefficiencies of fossil fuels being absorbed at the generating station, the taxpayer, like most users, is more concerned with the total owning and operating cost.

Since first cost is less, and owning and operating costs are less today with electric heating than with other forms of heating, we can afford to heat schools electrically today. I believe that each successive year will find it more practical. The rising interest rates and rising fuel costs since publication of the article would not detract from this conclusion, in my opinion.

Robert Lee Boyd
Development Engineer
Electromode Div.
Commercial Controls Corp.
Rochester, N.Y.

Seeing Iceland's Natural Hot Springs Heating System Memorable Experience

I found the article *Natural Hot Springs Heat Iceland* by William J. Whatley in the April HPAC interesting reading. In 1951 I had the good fortune to visit Iceland and to meet Helgi Sigurdsson, the director of the Reykjavik district heating system, who showed me over the hot spring region described by Mr. Whatley.

The Icelanders are very fortunate in that the water which they obtain from the wells at Reykir and Reykjaholio is so pure that it can be used directly as it comes from the earth. They are also fortunate in that the temperature is below the boiling point.

It is no exaggeration to say that they have a most remarkable system of surface and underground conduits. The design, the layout, and execution of this huge work reflects the greatest credit on the people of Iceland, who have made such a determined attempt to make the most of their natural resources and who by the use of their tremendous supplies of natural heat have reduced their expenditure on importations of oil and coal and thus helped to stabilize their economy as well as removing from their city of Reykjavik the ghastly pall of smoke which once shrouded the city for many months of the year.

The Icelanders have also used their natural resources most intelligently in constructing their pipe conduits from concrete and using slabs of peat and volcanic slags for insulating the pipe work.

A point not touched on by the author was the method which they use for getting rid of the dissolved gases before the water is taken from the wells to the pumping station and the ingenious way in which they get rid of the surplus water. There is also the method which they adopted to prevent the water picking up air and causing corrosion in the underground piping.

It is quite a memorable experience to see grapes ripening, Indian corn growing, and roses blooming in the greenhouses heated by geothermal heat within a few miles of the Arctic Circle and not far from the eternal snow and ice of the Vatnajokull.

W. L. Cooke
Mechanical Engineer
Auckland, New Zealand

Applauds Apprentice Training Program At Standard Oil, Other Organizations

Being active in the apprentice training effort myself, I was most interested to see the article *Pipe Fitter Apprentice Training Pays Dividends at Standard Oil* by Brace H. Lambert in the April HPAC.

During the past several years there has been a strong trend to revitalize apprentice training and on the job advancement training. In this work the Standard Oil Co., and especially the Wood River, Ill., refinery, has taken a leading role. They have been doing this training work longer and better than most companies and are to be congratulated.

It is interesting to note that Mr. Lambert finds the apprentice manuals in demand by the mechanics. This has been true in many other apprentice programs. A demand of this kind indicates an awareness on the part of the mechanic of the changes and developments going on in his field and of his need to keep in step.

In the article's evaluation of apprentice training, the expense was justified by savings in manhours and material. Surely the managment has seen considerable improvement in the quality of work performed, as well as the amount, that can be credited to training.

Several other large employers are doing excellent work in the apprentice training field, notably U. S. Steel, General Motors, and Ford. There are many others.

Of particular value to the piping industry is the outstanding work in apprentice training being done by the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the U. S. and Canada.

Such apprentice training is of tremendous value to the nation as a whole. Since the wealth and welfare of a nation is in direct proportion to the skills and the enterprise of its citizens, training such as described in this article is a definite contribution to that wealth and welfare.

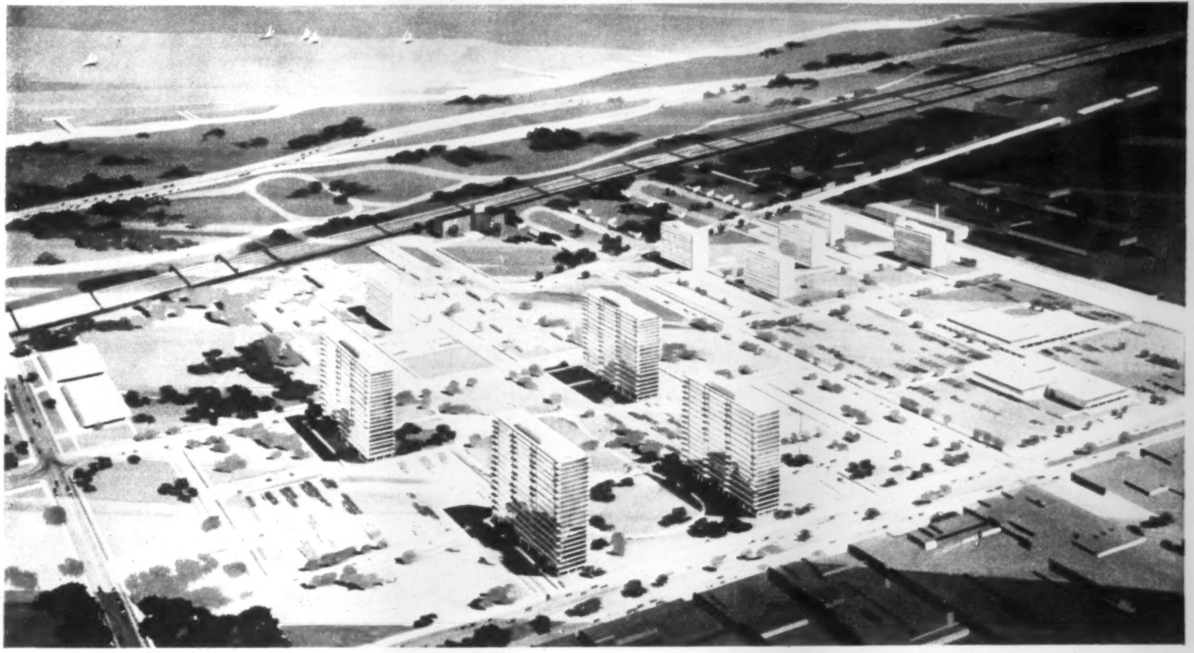
H. A. Sosnin
Special Representative
Tube Turns
Louisville, Ky.

Mr. Sosnin is chairman of the American Welding Society's apprentice training committee and a member of the apprentice training committee of U A Local 428.

Architects-Engineers Credited for Work On Indiana Toll Road Plazas

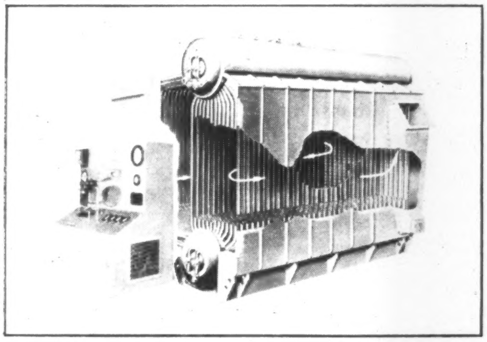
The article *Grid Type Coils Melt Snow at Toll Road Plazas* by Riley Shuttleworth, consulting engineer, in the March HPAC omitted the name of the architect. The firm of Edward D. James, Clyde E. Williams and Associates, Inc., was in charge of all the architectural and engineering work involved in the design of the Indiana toll road plazas. While designing these snow melting systems, Mr. Shuttleworth was employed by the engineering firm of G. M. Williams, who was retained by the above firm.—The Editor

Architect's rendering of the Lake Meadows project. Skidmore, Owings and Merrill, Architects.



Chicago's newest planned community

is served by C-E Boilers



Cutaway view of typical VP Boiler. For capacities from 4,000 to 40,000 lb of steam per hr. Pressures to 500 psi. Oil or gas fuel.

Firing aisle of the Lake Meadows boiler room showing three of the five C-E Package Boilers, Type VP.

Located on a 100 acre site overlooking Lake Michigan, Chicago's newest planned community, the Lake Meadows project, offers gracious living within the confines of a large city. Owned and managed by the New York Life Insurance Company, Lake Meadows provides distinctively appointed apartments, spacious grounds, a modern shopping center, ample parking facilities, yet is within minutes of the heart of the city. When completed, this project will house 2000 families and will include an eight acre park. Construction has already begun on a new elementary school located on two acres adjacent to the housing development.

A project of this size requires considerable steam capacity to provide ample heat and hot water as well as to perform the many other services required. To do the job, the New York Life Insurance Company originally selected three C-E Package Boilers, Type VP. Later, as new housing units were added, two additional VP Boilers were installed. Their outstanding performance and efficient, trouble-free operation is evidenced by the repeat order placed with Combustion for the final two units.

Complete information on C-E Package Boilers is available in Catalog VP-3. Write for your copy.

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.
Canada: Combustion Engineering-Superheater Ltd.

B-986B

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS, PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

Question of the Month

What's the Correct Way to Trap Steam Headers and Tracing Lines?

This question was asked previously in HPAC and was published with some of the answers that have been received from readers in the March and April HPAC's. Other answers or comments for publication are invited.

"We have been having considerable discussion as to the correct method of trapping steam headers and steam tracing lines, and we would like to know if others have some suggestions.

"We are confronted with determining the correct distance between traps on a steam header and on steam tracing lines. Steam pressures will vary from 2 psi to 400 psi. The tracing line sizes are from ½ in. to 2 in. in diameter. These installations will be in various parts of the country from Louisiana to Canada"—E.R.E.

Place Traps Wherever Condensate May Collect; They May Require Support

THE MOST IMPORTANT factor to remember when trapping steam mains is to place traps at all locations where condensate can collect, irrespective of the length of main, steam pressure, pipe diameter, or resultant distance between traps. Recommended trapping points are ahead of shut-off or reducing valves, ahead of risers and loops, at the ends of mains, at expansion joints, on separators and line purifiers, and so on.

Installation of traps at these critical locations will, in most cases, provide more than ample capacity to take care of the condensing rate of the piping.

Because of the many variables involved, there is no generally accepted formula for spacing traps on mains which have no natural drainage points. Usual practice is to space them 100 to 500 ft apart.

It is one thing for condensate to form in a steam main, but quite another for all that condensate to get to the trap. Therefore, in the absence of natural drainage points, a means must be provided. For best results, use any of the following methods: a full sized tee, an old gate or globe valve body, a sandwich piece, a dam welded in the pipe, a large size drip leg, or a separator.

A small diameter pipe stuck into the bottom of a large main is unsatisfactory, as the high velocity of steam — perhaps 90 mph — will carry condensate right over such a small opening. The point to be remembered is that even the best steam trap cannot make condensate flow to it.

A steam main should be erected, if possible, so that it has a continuous fall in the direction of the flow — about 1 in. to 30 ft — and it should be so supported that it cannot sag. Provided the main is so properly pitched, condensate not previously trapped will find its way to the end. This is another certain place where the main should be trapped.

The recommended way to drain the end of the

(Continued on page 90)

READER ASKS—

"Should Air Be Recirculated After Cooling Electric Office Machines?"

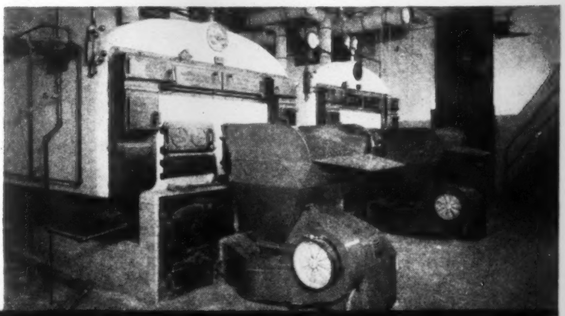
"Is it more economical to exhaust room air to the outdoors which has been heated in cooling electric office machines such as IBM equipment or to recirculate this air back through the air conditioning equipment?

"The conditions inside the building are 75 F dry bulb and 50 percent relative humidity. The temperature of the heated air being exhausted from the building is 90 F. The outdoor design conditions are 100 F dry bulb and 78 F wet bulb. These design conditions are close to the maximum temperatures ever recorded, so the frequency at which they occur is very low.

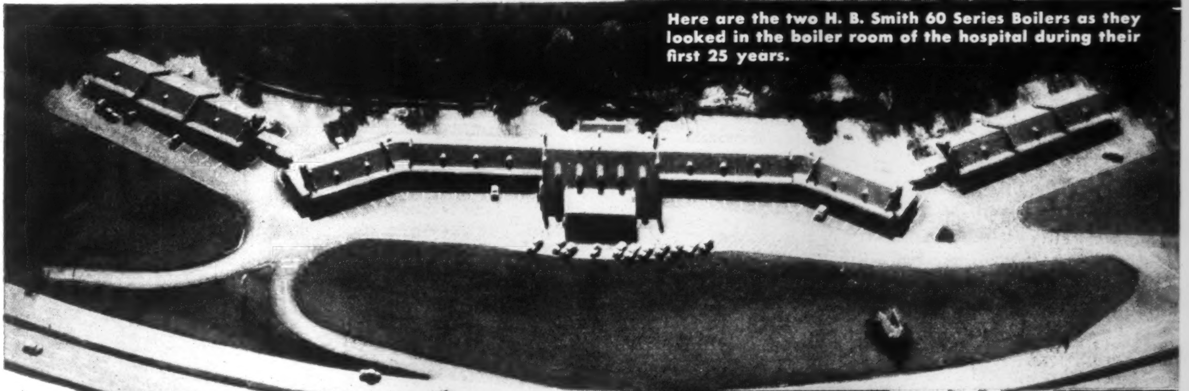
"Comments from other HPAC readers on this will be greatly appreciated."—J.H.

• *YOU ARE INVITED to answer this question. Write: The Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

After 25 years in a hospital—



Here are the two H. B. Smith 60 Series Boilers as they looked in the boiler room of the hospital during their first 25 years.



Here are the two H. B. Smith 60 Series Boilers as they look today in the boiler room at Framingham Motor Inn.

They look well, don't they!

Motorists who get around agree that the Framingham Motor Inn at Framingham, Massachusetts, is one of the finest and most modern motor courts in the country.

It isn't surprising that the heat and hot water for this 102-unit paragon of repose are supplied by two H. B. Smith boilers. Nor is it surprising *to those who know boilers* that the two boilers selected for the installation *already had served for a quarter-century in a Rhode Island hospital!*

After 25 years of day and night service, conventional boilers would be ready for retirement . . . but H. B. Smith boilers are still going strong. This is because they have vertical cast iron water tubes which are an integral part of the boiler, and are highly resistant to fuel acids and feed-water impurities.

H. B. Smith boilers respond quickly, and maintain high efficiency with minimum attention. Maintenance costs are negligible and new sections can be added to provide greater heating capacity as a building is expanded.

Framingham Motor Inn can look forward to another quarter century of service from these boilers. After all — they've had *experience!*

H.B. Smith CAST IRON BOILERS

H. B. SMITH CO., INC., WESTFIELD, MASSACHUSETTS • *Established 1853*

(*Continued from page* 88)

main is to elbow or tee down and drip to the trap from the side of this fitting, sufficiently above the bottom to let dirt and scale settle.

A thermostatic trap is needed at the end of a main to assure the complete discharge of air and other noncondensable gases in the main at the time of initial warmup, or carried over from the boiler.

Several computations must be made to correctly size traps for steam mains. First the warmup load — the amount of condensate formed in raising the metal pipe from room temperature to steam temperature — must be calculated simply. Secondly, the normal radiation loss from the piping must be determined. Both these computations can be made very easily by using the tables found in most steam trap catalogs.

Traps should be sized to handle the warmup load plus one-half of the radiation load, since the radiation load builds up as the warming load drops off. Depending upon conditions, a suitable factor of safety should be used.

Thermostatic bellows traps are ideally suited for trapping steam mains and tracer lines. These traps have a greater capacity for discharging condensate and air than other types of traps of comparable pipe size. A large capacity is particularly desirable when handling the warmup load.

The same basic principles apply to the trapping of steam tracer lines. These lines are of small diameter — frequently tubing — supplied with steam at low pressure, and are usually without natural drainage points.

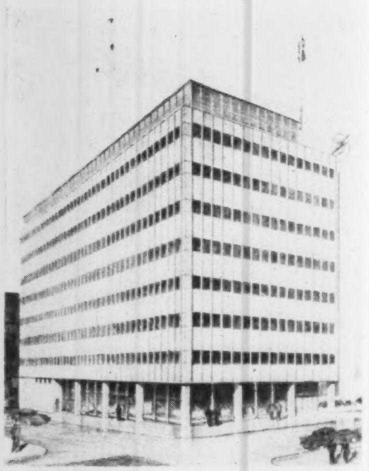
As with steam mains, there is no hard and fast rule for spacing the traps, but because of the small diameter, it is advisable to utilize a number of small traps rather than one larger trap at the end of the tracer.

A unique consideration enters into the picture when considering tracer lines. If copper tubing is used, often it is not strong enough to support a steam trap. Resort must then be made to brackets, straps, or clamps, or the traps must be placed at locations where the piping itself is supported — at uprights, from overhead framing, structural columns, or other points. In other words, traps may have to be placed where they can be supported.

Edward T. Shadek
Sales Engineer
W. H. Nicholson & Co.
Wilkes-Barre, Pa.

Air Source Heat Pump Air Conditions Office Building

. . . *largest system of its kind*



The new 10 story home office building of the Columbus and Southern Ohio Electric Co. in Columbus, Ohio, will be heated and cooled by the largest heat pump system of its kind to be installed in an office building, according to Ray K. Serfass, vice president and general manager of the industrial division of the York Corp., subsidiary of Borg-Warner.

A 550 ton compound compression air source heat pump system will cool the 180,000 sq ft building during the summer months and will use outside air as a heat source to warm the building's interior in winter. No supplementary electrical heating or conventional fuel fired boilers will be used.

In addition to the 550 ton heat pump system, which will be in a rooftop penthouse engine room, six small air source heat pump systems aggregating about 75 tons of cooling capacity will be used for air conditioning special areas such as the auditorium and display rooms, as well as for the production of domestic hot water.

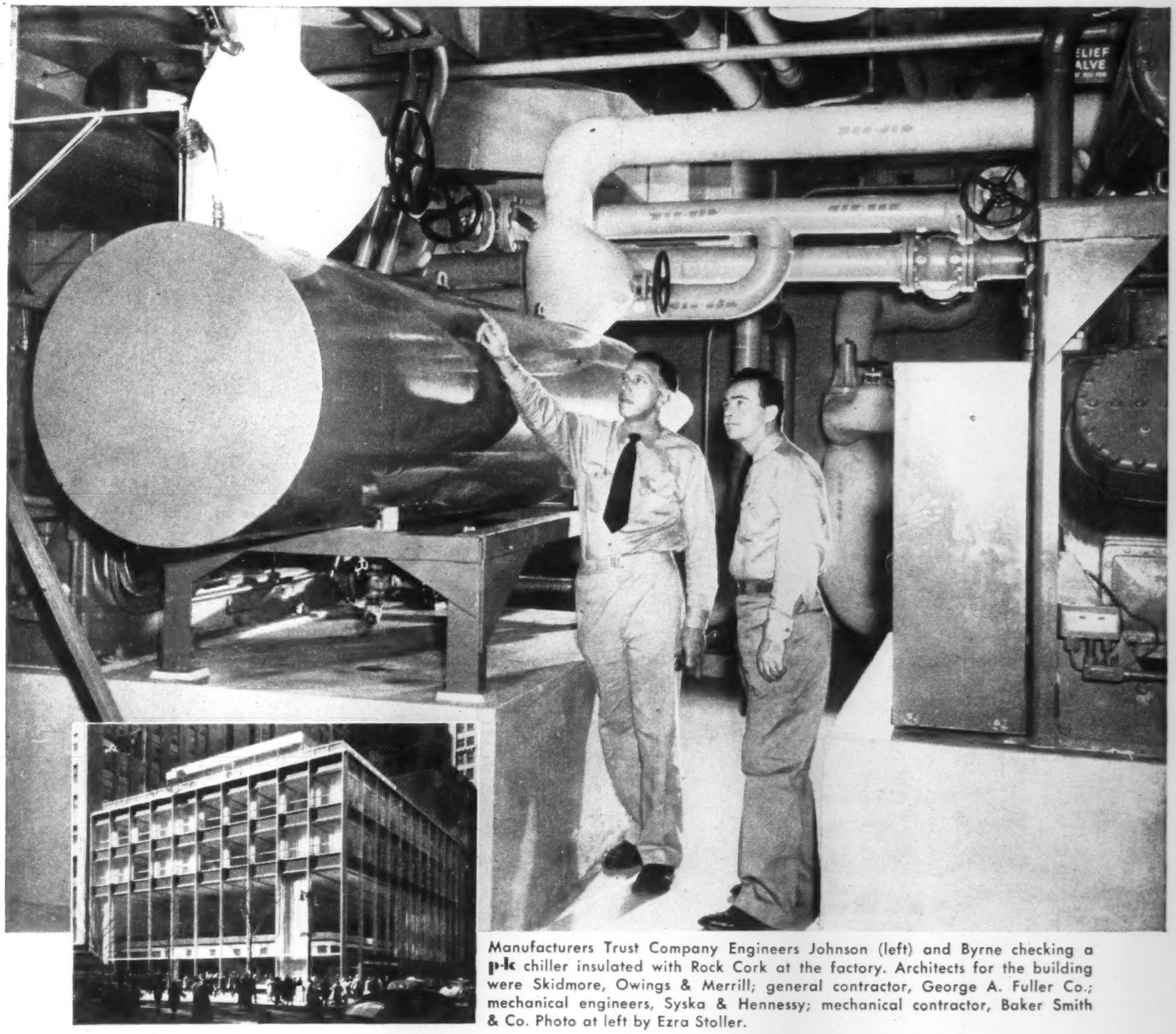
The rooftop equipment room will contain two identical 275 ton systems, each consisting of three 100 hp compressors and one water cooler, as well as an outside air cooler which will serve as an evaporative condenser in the summer.

An electronic center will provide automatic control for the entire cooling and heating plant. The system will automatically go from cooling to heating and back to cooling in response to temperature changes in the outside air.

The peripheral office areas of the building will contain 550 furred-in high pressure induction units which will provide year 'round automatic temperature control. Interior zone air conditioning will consist of a complete high pressure distribution system.

Construction of the building has been started and the structure is scheduled to be completed early in 1958.

The architect is Edgar I. Williams. Ebasco Services, Inc., are the engineers and constructors for the project. ✠



Manufacturers Trust Company Engineers Johnson (left) and Byrne checking a p·k chiller insulated with Rock Cork at the factory. Architects for the building were Skidmore, Owings & Merrill; general contractor, George A. Fuller Co.; mechanical engineers, Syska & Hennessy; mechanical contractor, Baker Smith & Co. Photo at left by Ezra Stoller.

Worthington relies on p·k chillers in the world's most distinctive bank building

When this "house of glass" opened at the corner of Fifth Ave. and 43rd Street in New York last year, 40,000 visitors came to take a look. Small wonder! For in this newest and largest branch of Manufacturers Trust Company, they saw architectural history being made.

No longer are bank tellers "caged." Customers transact their business in a new atmosphere of space, light and friendliness.

Contributing to this feeling of unhurried friendliness are two 150-ton Worthington air conditioning units, each equipped with a p·k dry expansion Freon chiller. This super-efficient system "reconditions" all five stories of the building every three to five minutes with 97,000 cu. ft. of fresh, low-humidity, 74 F air. It's automatic, too, shutting down by itself at 11 P.M. and starting again at 6 A.M., to assure a comfortable working climate for the bank's 280 employees – and their customers – at the start of each day.

Teamed up with Worthington's famous "million dollar" compressors, p·k chillers each supply blowers with 331 gallons of water per minute, chilled from 50 F to 40 F.

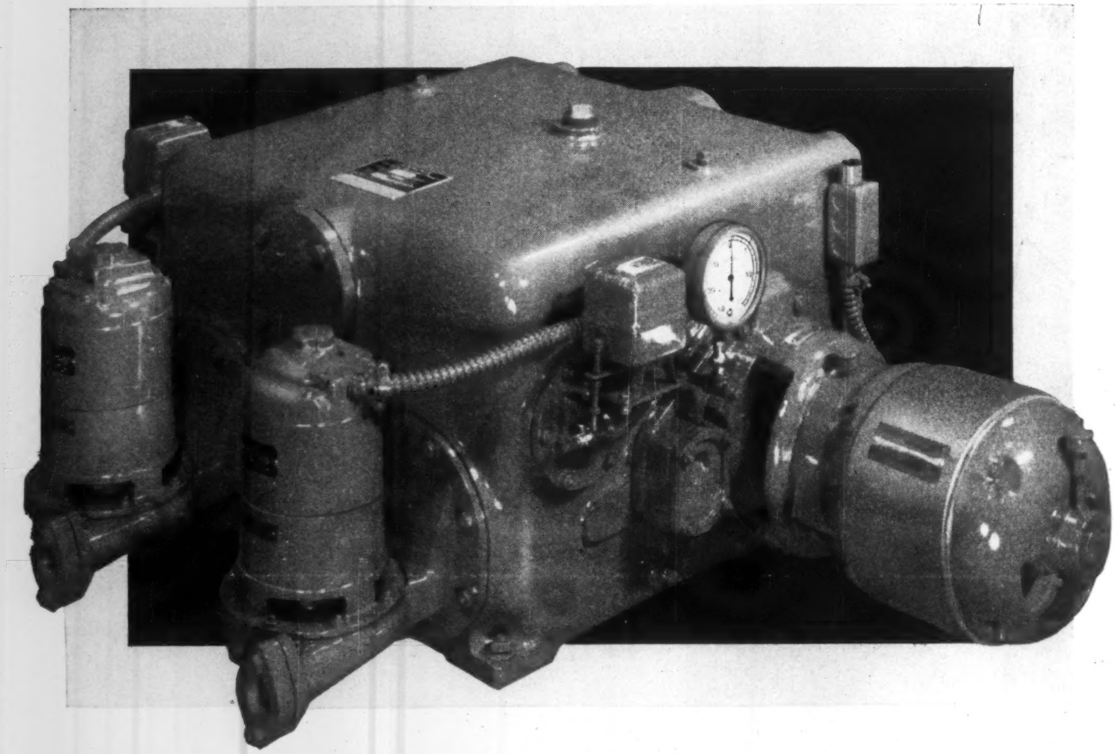
For full information on these complete units write Worthington Corp., Dept. PK, Harrison, N. J. today. Or write for Catalog 101 on p·k chillers to The Patterson-Kelley Co., Inc., 750 Burson Street, East Stroudsburg, Pa., and principal cities.

2579

PATTERSON-KELLEY

Flooded and Dry Expansion Type Freon Coolers and Storage Water Coolers • Freon Condensers • Allied Refrigeration and Air Conditioning Equipment

THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



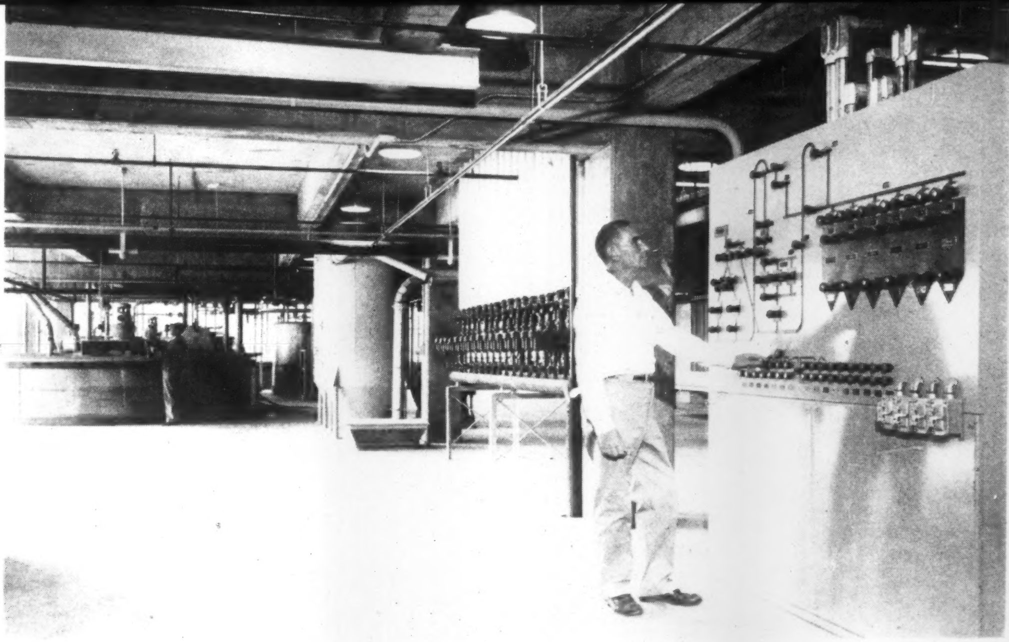
It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ Increased air capacity induces rapid system response without wasteful overheating.
- ✓ Separate air and water pumps individually selected to meet actual job requirements.
- ✓ Control system that operates individual pumps only when needed.
- ✓ Flexibility permitting addition of radiation without changing basic pump installation.
- ✓ Low, low, return line connection.

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.



Central panels control the flow of dry starch from two driers, through blenders, to bulk storage bins

Stainless Steel Piping, Equipment In Starch Plant Resist Corrosion

Much stainless steel piping is installed in this recently completed starch drying plant. The reason: problems of corrosion, erosion, and sanitation.

Steam is reduced from 185 psig to 125 psig for process use. Exhaust steam from the turbines in the steam plant at 3 psig is used in the preheating coils to the starch driers and for building heating.

THE NEW starch drier building of the A. E. Staley Manufacturing Co. at Decatur, Ill., is equipped with facilities for drying, packing, and loading starch for industrial uses. The building has many features new in corn processing construction.

It is a three level building, with the west, or wet starch end, a six story structure; the east, or dry starch end, eight stories high; and the center, where elevators and machinery are housed, being 10 stories high.

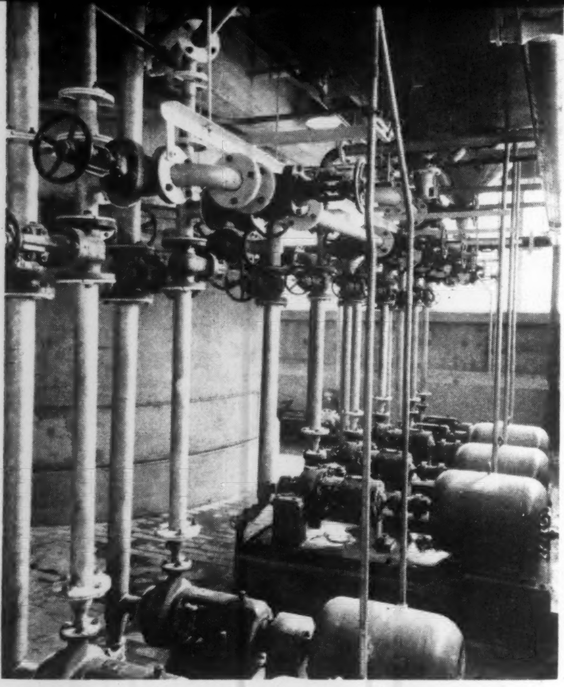
From the control panels on the second story in the west end of the building the operator can route the starch as it comes from the blenders to bins or packers on another floor or to any other part of the process to which it is to go.

Great Amount of Stainless Steel Used

The starch, which comes from another plant building, is pumped in a slurry through 6 in. stainless steel pipe. From the driers it goes to the blenders, then across to the other side of the building — the dry starch end. Eight holding bins, 11 ft square and 35 ft high, on this side extend from the eighth floor down to the fourth.

All of the pipe lines, except for the valves, as well as

two-segment backup flanges



STAINLESS STEEL starch slurry pumps, valves, and stainless steel tubing are connected by stainless steel tubing joints. Flanges are sealed with rubber gaskets. Note view of one of the 25,000 gal stainless steel starch slurry receiving tanks

all of the equipment handling starch slurries and filtrates, are of Type 316 stainless steel construction.

The installation makes full use of automatic and other labor saving equipment. Processing systems are operated by centrally located control panels, and electric interlock connections insure that components of the system are started or stopped in proper sequence. Similarly, automatic shutoffs and level controls provide for immediate stoppage in case of emergencies.

Precut Tubing to Control Lengths in Shop

Pipe lines 1½ in. and smaller are standard iron pipe size with screwed fittings. Lines over 1½ in. in diameter are of light wall tubing, welded. For sizes 3 in. and under, 16 gage thick wall piping is used, and over 3 in., the wall thickness is 14 gage.

Fittings for the light wall stainless steel tubing are 12 gage, formed with a flange cold rolled on the outlets. The tubing was cut to the correct lengths in the company's own shops, with a friction saw, and a flange was cold rolled on the ends in a special hydraulic machine.

Here's How the Starch Flows

HERE'S a brief description of the starch process and of the equipment units that serve the various steps.

Stainless steel receiving tanks, fitted with 15 hp turbine agitators and of sufficient size to hold a full batch of modified starch, are on the ground floor in pits to protect dry storage areas in case of spillage. Starch slurry is pumped from the starch conversion building to these receiving tanks, and from there to nylon screened shakers on the top floor of the wet starch wing of the building.

The slurry moves by gravity from the shakers to four drum type vacuum filters with string discharges. The filters are 8 ft in diameter, 10 ft long, and are equipped with rubber grid drainage decks and stainless steel drums and tanks. Two water sprays on each filter are designed to obtain optimum washing of the filter cake, 95 percent of the filtrate in the cake being replaced by clean wash water.

The finely dispersed starch remaining in the filtrate and wash water is then separated by clarifiers. An adaptation of the cyclone separation principle used for dust collectors, the clarifier recovers the starch as a concentrated suspension which is returned to the slurry before the filters.

The discharge from the filters is fed directly into driers of the continuous apron type, in which propeller type fans recirculate preheated and filtered air through the starch. The recirculated air is passed through heat exchangers with a total internal radiation surface of 3200 sq ft. The four driers are of aluminum and stainless steel construction, and are equipped with belts 85 ft long and 10 ft wide. Six exhaust fans with a total capacity of 40,000 cfm remove the humidified air from each drier.

Steam pipes in the heat exchanger bank are constructed of copper to reduce starch contamination. The bank is placed beside the belt so that accumulated starch on the pipes will not fall onto the belt. Also, increased air velocity in the driers will help to prevent starch buildup on the heat exchanger pipes.

The starch from the driers falls into ribbon blenders of 13,000 lb capacity in which continuous mixing maintains uniform particle size and bulk density. To accommodate the increasing demand for specialty starches, provisions are made for the mixing of blended products with a minimum of handling; that is, secondary components may be added directly to the starch in the blender without a preliminary transfer of the major ingredient to other equipment.

By handling the dried starch through enclosed systems at all times and by the use of a vacuum sweeping system, starch dust is almost eliminated.

of carbon steel join around tubing, are bolted to mates

The tubing is joined to additional lengths of tubing and to the fittings as well as to the standard flanged valves by means of carbon steel backup flanges. These flanges are made in two segments and are joined around the tubing and bolted to the mating flange. A rubber gasket ring is used between the ends of the tubing and fittings.

This type of joint can easily be disconnected and reconnected for maintenance or changes in the system without welding or cutting or disruption to other parts of the process which are especially important in a dry starch building where there are explosion hazards.

Velocity One of Most Important Factors

The design and sizing of these lines handling starch slurries are based largely on data collected over the many years of experience in similar installations. As in many other piping systems, velocity is one of the most important factors in the design. A too low velocity will allow the starch to settle out in the line causing a gradual buildup which even though it may not completely choke the line, is undesirable from the sanitation standpoint. A velocity higher than necessary causes excessive power cost.

Valves on starch lines over 1½ in. in diameter are iron body, bronze trim, rising stem, standard 125 psig gate type. Valves 1½ in. in diameter and under are all bronze gate type. Where throttling or controlling is necessary, a rubber diaphragm type is used.

Install Spare Pumps with Cross Connected Piping

The pumps handling starch slurries and filtrates are open impeller centrifugal types with Type 316 stainless steel impellers, shafts, and casings. The selection of pumps as to capacity and head was also based on past experiences.

Spare pumps are so selected and installed with the necessary cross connected piping that one spare may be used in an emergency for more than one size of pump or type of service for short periods while the regular pumps are being repaired or replaced.

Steam pumps are used to pump floor washing waters from the acid brick lined sumps.

Combine Automatic and Manual Control

All centrifugal pumps have motor starter buttons located near the pump and also starter buttons and running lights on panel boards at the operators' stations on the other floors of the building.

The liquid levels in the various tanks are indicated by manometer type level gages on panels near the operators. The starch slurry to the filters is manually controlled by diaphragm valves, with the flow being recorded on a chart recorder. The liquid levels in the starch filter bed tanks are maintained with level controllers.

Reduce 185 Psig Steam to 125 Psig for Process

The pipe lines handling steam and condensate in the building are standard weight black steel pipe. Lines 2½ in. in diameter and over are all welded construction except at valves and equipment. Iron body, bronze trim gate valves are used in these lines. Lines smaller than 2 in. are standard steel pipe with screwed fittings and all bronze gate valves.

Steam at 125 psig is used in this building in the starch drier heating coils and to operate steam pumps. This steam is reduced from 185 psig boiler pressure to 125 psig before it enters the building.

Heat with 3 Psig Exhaust Steam from Turbines

Exhaust steam from the turbines in the steam plant at 3 psig is used in the preheating coils to the starch driers and for building heating. A steam booster station cross connected with the 125 psig steam automatically maintains this pressure at a minimum of 3 psig at the building. The 3 psig steam main from the power plant is made of 10 gage spiral welded pipe 24 in. in diameter and is a branch of the low pressure network extending to other buildings. The total run of pipe from the power plant to this building is approximately 1000 ft. The combined steam load for this building is more than 60,000 lb per hr.

Bucket traps are used on the 125 psig steam coils which discharge to a flash tank with the released steam

ROOF EXHAUST FANS total 24, of which six exhaust the hot, moisture laden air to the atmosphere from each of four large 85 ft long stainless steel and aluminum driers. Compare size of fans with size of man entering the 3 psig system and the condensate entering a collecting tank from where it is pumped back to the boiler house. Traps are also used on the 3 psig steam system. A vacuum condensate unit collects the condensate and pumps it back to the boiler house.

All steam and condensate lines are lagged with 85 percent magnesia pipe covering with 8 oz canvas pasted on. Outdoor lines have an additional protective cover.

Twenty-four indicating temperature controllers and double ported, bronze body, diaphragm operated, teflon packed valves control the steam to the heating coils in the driers, by the temperature of the air in the driers.

Unit Heater-Ventilators Serve Drier Section

The building is divided into two sections separated at the various floors by concrete walls and fire doors. One section contains the wet process and the driers. The other section contains the dry starch bins, packer, and handling equipment. The drier section is heated and ventilated with unit heaters located at the ceilings with outdoor air connections to the outside of the building. There are nine of these units in this section handling approximately 50,000 cfm of air with $5\frac{1}{4}$ million Btu per hr capacity with 3 psig steam.

Maintain 50 Percent Relative Humidity

In the dry starch section of the building, central station air conditioners with humidifiers are used. These have a capacity of over 30,000 cfm and approximately $4\frac{1}{2}$ million Btu per hr. These are designed and located to maintain a relative humidity of 50 percent in this section of the building.

Locker rooms, stairwells, and other isolated spots are heated with convectors. ⌖

Rotary Oil Burners Fire Hartford Statler's Boilers

. . . three 185 hp water tube boilers produce 35,000 lb of steam per hr

THE HEATING PLANT of the new air conditioned 455 room Hotel Statler, Hartford, Conn., consists of three 185 hp water tube boilers which are fired by three horizontal rotary oil burners, according to York-Shipley, Inc.

Provided with automatic firing with heavy fuel oil, flame modulation is in response to automatic control throughout the entire burner range.

HARTFORD STATLER, 455 rooms, is striking example of trend to functional design

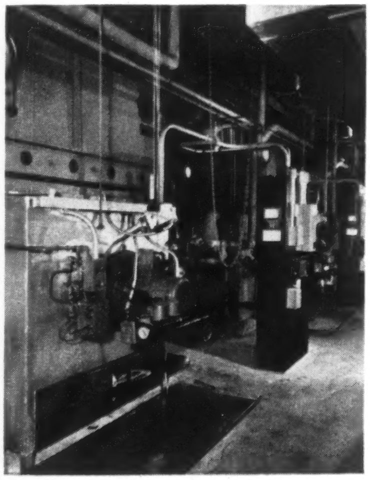
This equipment supplies steam to heat a total floor space of 180,000 sq ft.

The plant has a capacity of 35,000 lb of steam per hr. Steam for heating the building is passed through an indirect heater, which supplies the heating system for the building with forced hot water and also provides domestic hot water.

The load is quite variable, but the control panel enables quick response to sudden load changes.

The latest in combustion control and boiler feedwater control equipment is installed. Completely automatic firing requires very little attention from a combustion standpoint, but daily chemical tests of boiler feedwater must be made to assure proper conditions.

Two 18,000 gal tanks store the Bunker C fuel oil. The heavy oil is preheated by a steam fuel oil heater and a safety heater — electric element — at each burner. Two rotary pumps, each with a capacity of 120 gph, deliver the oil from the storage tank to the burners. A 500 kva transformer is used to ignite a gas pilot, which in turn ignites the Bunker C fuel. ⌖



THREE BOILERS supply steam for all hot water requirements and to heat 180,000 sq ft of floor space

Government to Air Condition Most Buildings in Next Decade

To develop a better understanding of the need for and the economic values of air conditioning 400 representatives from government and industry met in Washington recently. This government-industry symposium on air conditioning was sponsored and planned by the General Industrial Equipment Div. of the Business and Defense Services Administration of the U. S. Dept. of Commerce.

Recognizing that air conditioning is a modern necessity for all government installations in areas where it is warranted, they met with the purposes of:

1) Pooling the knowledge of government and industry in an effort to obtain the maximum benefit of money and manpower spent on air conditioning, and

2) Laying the groundwork for an active program of government-industry cooperation in the study of present and future common air conditioning problems.

Speakers included key men in both government and industry. Highlights of their talks are presented here.

• *air conditioning needed in most buildings under GSA*

"WE ARE WELL AWARE of the need for air conditioning in most of the federal buildings under our jurisdiction," said F. Moran McConihe, commissioner of public buildings, General Services Administration.

"What are we doing about it? What are our ultimate plans?

"Generally speaking, we hope to air condition all federally owned buildings east of Wyoming except those in the upper tier of New England and in northern New York, Michigan, Wisconsin, Minnesota, and North Dakota. We also include most of the states in the Southwest and the interior of Southern California. We have estimated that it will cost approximately $178 million to air condition the 1883 existing buildings in this area.

"At the beginning of the fiscal year 1957, about 10 percent of government buildings in which we have an interest were air conditioned. The small share probably reflects the fact that prior to last year, no funds had ever been specifically appropriated for this purpose.

"However, last year we were given an appropriation for air conditioning — $18.1 million — which enabled us to get a start on our program. Of the total, $4.5 million was earmarked for use in the District of Columbia and $13.6 million for use outside.

"In using this appropriation we are concentrating on installations in the southern Atlantic seaboard and Gulf states and on larger buildings elsewhere in our target area. We are using some funds to advance plans and specifications for projects which we hope to complete out of our '58 budget.

"For fiscal '58, the first full year of our air conditioning program, we have requested nearly $15 million. This amount would be applied, as was our '57 appropriation, against our long range requirements for some 375,000 tons of air conditioning to be installed at a cost of $328 million.

"We originally thought our objectives could be achieved within 7 years. It now seems likely that we will have to revise our planning in order to extend the program over a longer period.

"As for new construction, it is GSA policy to install air conditioning wherever the building is in a location that warrants it.

"Our present policy does not include air conditioning temporary buildings or rental property. However, we are making air conditioning a requirement in many of the buildings which we are leasing as the government's agent.

"Although we concentrate on central and not piecemeal installations, the principal deterrent to more rapid progress of our plans is the high cost of air conditioning existing buildings. Each is, of course, a custom job which

SUPREME COURT was one of the first U.S. government buildings to be air conditioned

usually demands the greatest ingenuity and skills from the engineers, contractor, and manufacturer concerned. For example, it is costing GSA over $6 million to design and install air conditioning in a single structure here in Washington: the south building of the Dept. of Agriculture. Although this is one of the more challenging and costly jobs which we must tackle, it shows what a single job can do in depleting our limited funds.

"Not only must we make our air conditioning dollars stretch just as far as they will go, we must also stretch the life of the equipment installed. Unlike private businesses, we cannot write off air conditioning costs through tax deductions. Therefore, we must concentrate in planning on and purchasing equipment which will provide efficient service for the longest period possible. This means we must be alert constantly to new developments — in design, techniques, and equipment. Again, we are dependent upon the industry to keep us abreast of these developments and to help us determine the type of equipment which is best for a specific installation.

"Because of the many safeguards which are applied in the use of public funds, projects involving them move slowly. Ours are no exception. We cannot, of course, commit funds we do not have, but we certainly can and do plan ahead for the day when we have them. So it is important that we know what the industry is planning so we may take anticipated developments into consideration in the preliminary stages of our projects," he said.

• government problem in air conditioning needs teamwork

"The government problem in air conditioning requires the assistance of and very close cooperation with industry," said Fred S. Poorman, deputy commissioner of public buildings.

"Basically our problem is fourfold:

"1) The development of a well documented air conditioning policy together with a program of essential requirements which will prove acceptable to budget officials and congressional committees.

"2) Optimum correlation of policies, practices, and criteria among the government agencies and the translation of these criteria into suitable designs largely through the use of private engineering organizations.

"3) Industry's assistance in standardization.

"4) Provision for suitable adequately trained operating and maintenance personnel.

"How difficult our task, how well we succeed, and how acceptable air conditioning will prove over the years will depend to a marked degree upon teamwork among the federal agencies, the design engineers, standardization within industry, and the success of training programs," he said.

• air conditioning economically justified by 'payoff' factors

Economic justification of the cost of air conditioning was discussed by Cloud Wampler, chairman of the board, Carrier Corp. "In the majority of markets air conditioning is accepted as an economic necessity. Not as a luxury nor a frill, but as a key ingredient for profit. In market after market, the question today is not whether to install air conditioning but rather which is the proper equipment to do the job?

"The decision to install air conditioning is not made primarily because an air conditioned environment is pleasant. No chief executive officer could justify the expenditure on that basis alone. His decision must be on a dollars and cents payoff.

"The problems faced by the federal government in this respect are no different than those faced by private industry and commerce.

"As a direct result of air conditioning a structure, the economic returns come in the form of lower labor turnover, less expensive recruitment, fewer employee errors, less time lost, and a higher level of output. These represent the payoff.

"For example, as far back as 1938 Paul G. Heidman, then superintendent of buildings for the Detroit Edison Co., reported — in the October 1939 HPAC, p. 616 — a 50 percent increase in work output over the previous summer after its drafting and surveying bureau moved into an air conditioned office.

"In the heat wave that struck Washington in the summer of 1953 federal employees were sent home early day after day, 25,000 one day and 13,000 the next day. To some degree this story is repeated year after year. Many people are paying for air conditioning even though they don't themselves have it!

"A New Jersey industrial designer, surveying 75 manufacturing plants, found that a typical employer lost $108 per man per year from the effect of hot weather if his plant were not air conditioned.

"Records kept in the Shawnee, Okla., plant of Sylvania Electric, Inc., show that in addition to significant decreases in absenteeism and labor turnover, the productivity gain per employee in summer was 7 percent following installation of air conditioning. Another industrial concern claims a 16 percent increase, but its records are less reliable.

"What does it cost to own and operate air conditioning? About 5 years ago, the former federal commissioner of public buildings, W. E. Reynolds, made a study which showed that if employees save 7 minutes of effective time out of a total of 480 minutes in a workday, the employer can break even on air conditioning.

"Mr. Reynolds' estimates are in line with our own. We have found that the average annual cost of owning and operating an air conditioning system in an office building runs from $60 to $70 per employee. To offset this would require a very small increase in employee efficiency — 1 to 2 percent," concluded Mr. Wampler.

• *heat stress problems studied to reduce cooling costs*

THE LARGEST investment of air conditioning in Du Pont is for manufacturing areas, where relatively constant atmospheric conditions are required to provide continuity of production and uniformity of required product quality, according to Roger W. Fulling, engineering department, E. I. du Pont de Nemours and Co.

He said, "Our general policy is to evaluate each problem and decide on the proper solution based on its own economics. There are no set rules or tabulations from which can be selected the recommended system. This is rather basic since in the chemical and textile fiber manufacturing industry, no two processes or even two plants making the same product will necessarily submit to the same solution at a given cost.

"In the case of office space, lunch rooms, conference rooms, and service areas, the pattern more or less follows precedents of installations in operation in our existing plants or in other plants in the vicinity. Air conditioning is often a competitive factor in the employment of office personnel and certainly contributes to improved conditions in cafeterias.

"Du Pont has an experiment under way to study the fundamentals of heat stress, the first results of which were reported in the August 1955 HPAC, pp. 92-95. Further experiments will be required in which more variables are considered and the assumptions of the current experiment are tested and revised if necessary. The results of heat stress investigations must still be put into a form suitable for engineering use.

"Work load problems are the specialty of methods and standards engineers and heat load problems the concern of environmental engineers. The successful solution of the heat stress problems requires cooperative work by a research team consisting of a management engineer, an environmental engineer, a statistician, and a medical doctor.

"The benefits we expect to derive from a thorough study of the heat stress problem are:

"1) The health and safety protection of workers will be improved by defining the limits of excessive heat exposure.

"2) Major cost reductions should result from having the means with which to evaluate the economics of alternative solutions to heat stress problems.

"3) Improved employee relations will be fostered by establishing rest allowance on a more tangible and consistent basis.

"Industry must constantly keep abreast of new technical knowledge and be ever watchful of total costs. Studies are made covering various types of building construction and their effect on the required capacity of air conditioning systems. Total cost of the combined facilities are compared and studied for the indicated cost of the economic plant.

"It has been found that, with a constant transmission factor for a building shell, the cost of the required air conditioning system is not affected by the increased cost of a more elaborate type of structure. With a constant transmission factor for the shell of the building, the capacity of the required air conditioning system is dictated by the sum of the internal load and the ventilating outside air loads. The omission of windows in outside walls may reduce the cost of the required air conditioning system as much as 5 percent and the cost of the wall may be reduced as much as 30 percent.

"To obtain the lowest cost air conditioning system, it is obvious that the complete facility should be installed along with the construction of the original building. If the air conditioning system is not to be installed until later, all necessary planning for design and construction should be made toward ease and reduced cost of later installation. Even with the most detailed planning for later installation, the combined cost will be higher. If provisions are not made, the final cost will be still higher.

"Taking a base of 100 percent as the cost of the air conditioning system installed during construction, the two part job, that is with careful provision made for the future installation, could cost in the range of 110 to 125 percent. The installation, of a similar system in a building where no thought nor provision had been made for the installation, could cost in the range of 130 to 150 percent or even higher," Mr. Fulling concluded.

• great demand for air conditioning in planning future buildings

Architects are now receiving constant demand for air conditioning consideration in planning for future buildings, according to Leon Chatelain, Jr., president of the American Institute of Architects. This is especially true with large buildings, he said.

New churches in the Washington, D. C., area, for instance, are all being air conditioned when they are built. Likewise the trend to completely air condition hospitals is growing.

Schools are being given more attention in the feasibility of air conditioning classrooms to make the schools useful all year. Mr. Chatelain suggested that windows be eliminated in schools to eliminate the glare and uneven lighting which is not experienced with the new and improved artificial lighting.

Several years ago the mechanical equipment in office buildings represented about 15 percent of the total construction cost of the building. Today this ratio of mechanical cost to total cost is one to one, he said.

Several problems and questions were mentioned by Mr. Chatelain with reference to new trends in construction and air conditioning the space. Sound elimination is a major problem, and greater effort should be devoted to designing and installing quiet systems. Also, he raised the question as to why the supply and return ducts are larger than the building columns supporting the floors above and not planned as integral units during construction. The need for new approaches in the design and application of air conditioning systems for large buildings is great, he said.

• Prudential air conditions all space for employees

By 1968, all Grade A office buildings will be air conditioned, predicted John G. Jewett, vice president of the Prudential Insurance Co. of America. Mr. Jewett maintains that air conditioned office space pays dividends in more tenants who pay more rent and who will stay longer. He also said that an increase of 10 percent in rent for this air conditioned space will pay for the installation and operation of the system, probably in 20 years.

Loans on office buildings that are not air conditioned are the exception now, reported Mr. Jewett. These loans are only made by Prudential provided adequate wiring for future air conditioning is installed, and then the value of the loan is 66 percent of the appraisal, the normal regular limit.

In 1953 Prudential decided that all employees should have air conditioned office areas in most parts of the U. S. There were 1371 field offices at that time and 1578 offices today. There are 1100 of these field offices that have been air conditioned now. Also air conditioned are the Newark, N. J., home office and five regional offices recently constructed in Minneapolis, Los Angeles, Chicago, Jacksonville, and Houston. Planned is a new home office development in Boston that will be completely air conditioned.

• industry has four important resources government can use

"The air conditioning industry has at least four important resources which the government can use to advantage," said M. M. Lawler, vice president of the Worthington Corp. and president of the Air-Conditioning and Refrigeration Institute.

"They are:

"1) Ample manufacturing capacity.

"2) Technical skill in analyzing realistically a buyer's actual air conditioning needs.

"3) A program of standards being developed by the industry to protect customers, both government and private.

"4) Facilities for aiding important climate research programs.

"These are all designed to help the prospective buyer," he said. ⧧

Another article on the government's air conditioning program and problems will be published in an early issue of HPAC.

Sam Lewis' Page

Damper Location Is Key to Balancing Air Conditioning System

Many high pressure air delivery systems do not have volume control dampers at the branches from the main duct. This is usually due to the necessity of making the high pressure ducts perfectly air tight. Workmen who balance the air distribution from trunk line ducts, however, find much more trouble in equalizing the air supply to different rooms if the control dampers are in the outlet openings at the rooms than if the dampers are at the branch tees.

High pressure systems generally employ overhead air mixing boxes, where one high pressure duct delivers air warmer than the desired mixture, while a second duct delivers air cooler than the desired mixture. I have found in large jobs that have 20 or 30 of these blenders and noise blotters some difficulty in balancing the volume and temperature of the delivered air. The dampers for adjusting the air volume have to be in, or very near to, the blender-blotter boxes.

The blender-blotter sometimes is installed above a suspended ceiling. Any acceptable blender must have two dampers, one for warmer air and one for colder air. These dampers are adjusted by an electric or pneumatic motor that is mechanically connected to them.

When, in one case, this machinery above an acoustic ceiling eventually failed to perform, I removed about 25 sq ft of ceiling so as to reach the dampers and motor through the bottom of the blender. As a result, I recommend that where these boxes must be employed, they shall be exposed in the room so that they may be serviced.

It is desirable, of course, to apply the same skill in the design of the recirculation and exhaust ducts as in the design of the supply ducts. The designer of one high pressure system of over 100 overhead blender boxes provided a single unit for a president's office, but the designer ran two branch outlet ducts from this single blender to two adjacent offices. He thought that the president's room temperature might be the same as that of his secretaries' office. It proved to be an erroneous thought.

I have always been able to make an all-indirect heating and cooling plant serve acceptably if there is a thermostat that controls the separate air blender for every room.

The designer of another large general office high pressure plant specified auxiliary direct radiation below the windows around the perimeter of the building. The air blender dampers for each room were controlled by the respective room thermostats. The direct radiation, however, was controlled by east side - west side - north side zone thermostats placed outdoors. Conflict between the indoor thermostats and the outdoor thermostats inevitably resulted.

A hoped for static pressure regulator for each main duct in a high pressure air distributing system has been designed. These dampers near the supply fan attempt to tranquilize the variations in air delivery volume between the main warm duct and the main cold duct. They react as the distant warm air and cold air dampers as the blenders change position.

But I was discouraged with these dampers and their effect on a recent job when only one supply fan was expected to deliver air at two different temperatures but at one static pressure. At times the warm air main duct achieved too much pressure, and the cool air duct pressure was deficient.

On a similar job the designer had failed to provide any exhaust fan. It is hard indeed to achieve acceptable temperature control unless escape of the air from the rooms is commensurate with the supply.

The new Chicago ventilation code, though belated, helpfully mentions the necessity for getting rid of the old air so that it may be displaced by the introduction of new air.

We may have to use dampers at branches in high pressure air ducts made like steam valves, with air tight glands around the damper rods. Or perhaps a separate warm air supply fan as well as a separate cool air supply fan may become standard in these high pressure systems. ‡

SAMUEL R. LEWIS, *consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.*

KENTUCKY FAIR
EXPOSITION CENTER

In 22 acres of buildings on 357 acre site, many types of heating, piping, and air conditioning systems serve recently completed, $16 million . . .

Kentucky Fair, Exposition Center

- **vertical and horizontal unit heaters heat exposition building**
- **four separate forced air systems heat, ventilate coliseum**
- **combination heating-cooling air system conditions dining room**
- **fan-coil units air condition offices**
- **fan-coil units, minus cooling coils, heat auxiliary spaces**
- **10 miles of 1 in. welded wrought iron piping carries ice rink brine**
- **three package steam units make 45,000 lb of steam per hr**

BY EDWARD R. RONALD, JR.
E. R. Ronald & Associates
Consulting Engineers

THE KENTUCKY state fair and exposition center is said to be the largest multipurpose public affairs facility in the U.S. In the southern part of Louisville on a site of 360 acres, the structures themselves occupy 22 acres of ground.

Construction began early in 1954 and was completed in September of 1956 at a total cost of approximately $16 million.

The buildings include a stadium, coliseum, exposition building, cattle and swine building, offices, meeting rooms, dining rooms, cafeteria, and 10 horse barns.

The horse barns, frame buildings, are unheated, since they are used only in September.

The stadium, of reinforced concrete, has a seating capacity of 21,000 under roof and space for 10,000 more with bleachers.

Exposition Building Heated by Unit Heaters

The exposition building with a structural steel frame, brick and concrete block walls, and a lightweight concrete roof, has an open area 720 ft long by 320 ft wide. A 60 ft wide monitor extends the entire length of the building, and is 40 ft at its highest point. Two wings at one end contain auxiliary rooms.

The exposition building is heated by one row of vertical unit heaters in the monitor area and two rows of blower type unit heaters in the remainder of the building. Each row of heaters is served by a separate 50 psig steam line running the length of the building. Each steam line has six expansion loops.

Since the roof slopes on an angle with the width of the building, the loops follow the upward slope of the roof, necessitating trapping the steam line at each loop. This allowed the raising of the main at each loop, and the piping is at a maximum height. The trap discharges are able to raise the few feet to the roof beams with 50 psig steam pressure.

The auxiliary rooms are heated by small horizontal unit heaters. Inaccessible to the public, the heaters also simplify temperature control.

The horizontal and vertical unit heaters are controlled by pneumatic thermostats that operate the fan motor switches. The blower type unit heaters are equipped with face and bypass dampers controlled by thermostats on adjacent columns. The fans operate continuously.

All piping in the exposition building is uninsulated for economy and to provide additional heating surface. When the building is unoccupied, the temperature is held above freezing by the vertical unit heaters and the bare piping. The fans on the blower type unit heaters are disconnected, saving the cost of continuous fan operation.

The cattle and swine building, similar to the exposition building, is somewhat larger but is unheated since it is used primarily in the warmer months.

Dining Room Air Conditioned, Cafeteria to Be

The right wing at the front of the coliseum houses the dining rooms and kitchen on the first floor and the cafeteria and serving kitchen on the second floor. The dining rooms have a capacity of about 500 and the cafeteria 800 people.

The dining room has a combination heating and air conditioning system, the air being delivered by concentric ring ceiling diffusers.

One fan-coil unit installed in the basement for the dining rooms is supplied with chilled water from an adjacent 200 ton centrifugal refrigeration machine. The refrigeration machine obtains its condenser water from a cooling tower on the roof. The chilled water coil in the fan-coil unit is controlled by a three-way mixing valve actuated by a thermostat in the air discharge.

The fan-coil unit has a separate supply duct to each of the dining rooms. These ducts are provided with steam reheat coils controlled by thermostats in the conditioned spaces. A preheat coil is installed in the inlet to the unit to provide a uniform temperature to the reheat coils during the heating cycle. This system has the advantage of humidity control during the summer months, the reheating by zones.

The kitchen and dishwashing areas have independent supply and exhaust systems.

The cafeteria has a system similar to the dining rooms, but the cooling cycle was omitted for economy. Provisions were made for the future installation of the cooling coil.

A common outside air duct from the roof to the cafeteria and dining room fan-coil units in the basement supplies air which is drawn through a motor driven self-cleaning oil bath filter.

BLOWER TYPE UNIT HEATERS are installed in three rows in the exposition building. Each row is served by a separate 50 psig steam line with six expansion loops

Fan-Coil Units Condition Offices

The left wing at the front of the coliseum contains the general offices on the first floor and the meeting rooms on the second floor. The offices are air conditioned by fan-coil units located in a penthouse on the roof.

The cooling coils in the units are supplied with chilled water from the refrigeration machine in the basement of the dining room and cafeteria building. This system is similar to that of the dining rooms, except that the reheat coils are omitted, and automatically controlled recessed convectors are installed below the windows. These convectors are provided in the various individual offices to prevent discomfort from large glass areas.

200 Ton Compressor Required for Future Load

The three meeting rooms have a total capacity of about 2000 people. Because of diversified use and occupation, each is supplied with a separate fan-coil heating and ventilating unit. Direct radiation is not installed in these rooms because there are no windows.

These systems are similar to that of the cafeteria, with provisions made for a future cooling cycle. The summer portion of the system can be added by installing an additional 200 ton refrigeration machine in the basement of the dining room and cafeteria building, a cooling tower, coils, and controls. The chilled water piping and wiring are sized to accommodate the future load.

Cavernous Coliseum Is Nucleus of Center

The nucleus of the exposition center is the coliseum, which has been described as "a stadium under roof, without a bad seat in the house." With a clear span construction greater than that of Madison Square Garden, it has a clear area 470 ft long and 294 ft wide. Its ceiling is 90 ft above the floor, and its roof is 30 ft above that.

The coliseum is the largest indoor arena in the South

COLISEUM is heated and ventilated by four systems supplying 400,000 cfm of air. Ice rink piping is installed on cork board, asbestos paper, sheet zinc, and reinforcing mat

and the second largest in the U.S., with a seating capacity in excess of 20,000. This is the site of the annual Kentucky state fair horse show.

The oval shaped arena floor is about the same size as a regulation football field, surrounded by a wall which encloses the tiered stands. The stands are constructed at an angle of 45 deg at each of the four corners in order to follow the oval shape of the arena, and they extend up to within 10 ft of the ceiling at the exterior walls.

The void spaces at the four corners create equipment rooms which contain the heating and ventilating systems. The spaces below the stands provide auxiliary spaces.

Four Forced Air Systems Heat Coliseum

The coliseum proper is heated and ventilated by four separate forced air systems located in the corners at the uppermost level of the building. Each system has a supply air fan with a capacity of 100,000 cfm and a return air fan of approximately 75,000 cfm. The remainder of the air is exhausted through the auxiliary spaces. The slight positive pressure actually was of a critical nature, since the light aluminum ceiling panels might readily be displaced by a small air pressure.

Both the supply and return fans are of the centrifugal type, with backwardly curved blades. The supply fans are single inlet, single width; and the return fans are double inlet, double width. The supply fans are driven by slip ring motors with drum controllers to produce 50 percent speed reduction.

Each system has two banks of steam heating coils, tempering and heating; steam pressure is 5 psig. The tempering coils heat the outside air from 0 F to 42 F. The heating coils have a capacity to heat the air from 42 F to 75 F. Coils and dampers are connected to suply and return fans with heavy gage sheet metal housings with access doors to all interior parts. The systems are provided with a set of outside air dampers at the inlet to the tempering coil, exhaust dampers on the discharge side of the return fan, and return air dampers between the supply and return fans.

Each system is controlled by a remote bulb thermostat installed in the discharge of the return fan. The thermostat positions the outside air, return air, and exhaust dampers to admit more outside air as the return air temperature rises above the setting of the thermostat. On a rising temperature, the return damper moves to a closed position and the outdoor air and exhaust dampers modulate to an open position.

In addition to the above control, each system is provided with a three position switch to produce the following damper control:

1) During warmup periods, the return damper is open, and the outside air and exhaust dampers are closed.

2) When maximum ventilation is desired, the outside air and exhaust dampers are open, and the return dampers are closed. A total of 400,000 cfm of outside air is introduced into the building, producing about four complete air changes per hr.

3) For regular periods of operation, the dampers are controlled by the return air thermostat with the option of selecting various amounts of outside air up to 100 percent. During this cycle, a minimum of 25 percent outside air is supplied.

Each bank of tempering coils is controlled by an automatic steam valve actuated by a remote bulb thermostat on the discharge side of the coil. Each heating coil is controlled by an automatic steam valve which is operated by an averaging relay, which in turn senses the temperature at two return air louvers near the arena floor through remote bulb thermostats.

When the coliseum has a full capacity audience, a cooling problem results at outside temperatures above 35 F because of the internal latent and sensible heat gain.

Air is supplied by ducts in the truss spaces. The air is introduced to the arena through more than 150 concentric ring air diffusers, the average size of which is 20 in. neck diameter. The size of the diffusers varies with the slope of the seats. This, however, is not noticeable when viewed from the floor. Each diffuser is installed in the center of a perforated aluminum ceiling panel 4 ft square, and, because of the 60 ft ceiling, appears to be a small outlet in a conventional acoustical tile block. The branch ducts to the diffusers are provided with access doors to balance the system.

The return air is taken through louvers in a concrete wall at the bottom of the stands which connect the arena to the space below the seats. This space acts as a plenum and is connected with various ducts to the return fans above.

Fan-Coil Units Heat Arena's Auxiliary Areas

The auxiliary areas of the arena are heated and ventilated by 27 fan-coil units located under the stands. These units draw air from the arena and deliver it through a system of ducts to these areas. These units are controlled by automatic steam valves actuated by thermostats in the conditioned spaces.

The fan-coil units were provided for two reasons:

1) An inconspicuous system was required to heat the various spaces surrounding the arena.

2) The units also serve to remove the return air from the arena. This was not possible using entrances and wall louvers because the limited area would produce excessive velocity. The air discharged from the fan-coil units is picked up by the return fans through a series of grilles in the foyers and corridors and is exhausted or recirculated.

Ice Rink Has 10 Miles of Wrought Iron Piping

At the center of the arena is an ice rink 200 ft long and 85 ft wide. The rink is flush with the adjoining floor from which it is separated by an expansion joint. The ice rink coil consists of almost 10 miles of 1 in. welded wrought iron piping.

The space between the pipe coils and the subfloor was covered with 4 in. of cork board, asbestos paper, 5 gage sheet zinc, and a reinforcing mat. The coils are supported on horizontal tee iron supports placed on the zinc plates. Another reniforcing mat was placed above the coils. The top of the coils is 1⅜ in. below the finished concrete floor.

The cooling medium circulated in the floor coil is a calcium chloride brine solution. The system is provided with dual flooded type brine coolers, compressors, condensers, receivers, and brine pumps.

The condensers are supplied with cooling water from a tower on the roof. The system is provided with dual condenser water pumps.

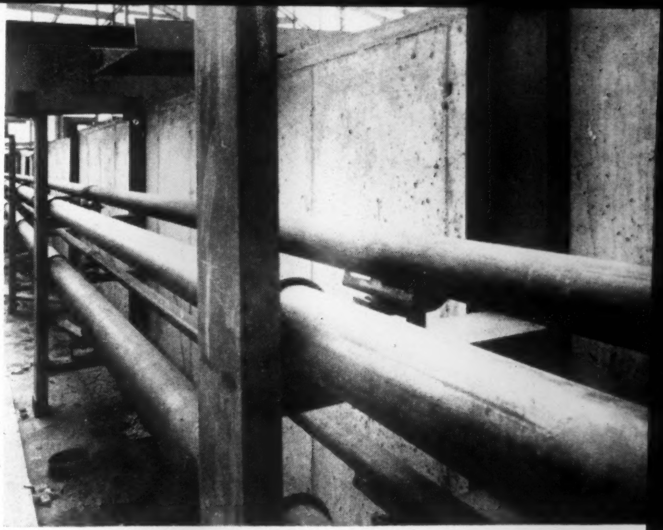
A cork insulated steel tank 29 ft long × 10 ft wide × 6 ft deep stores the brine solution.

All of the equipment is required for freezing the ice, but only one compressor, brine pump, and brine cooler is required to maintain the ice. During the initial freezing process the brine is cooled in the storage tank and then circulated at 12 F. Water is sprayed on the floor to build up a uniform thickness of ice. The ice is maintained by circulating brine at a temperature of 16 to 18 F, depending on the type of skating desired.

At one end of the rink a defrosting pit is provided. It consists of a concrete pit below the floor fitted with perforated steam pipes and drains. The brine is diverted from the coolers and heated in a steam exchanger to about 100 F. The warm brine is then circulated through the coils and the softened ice is scraped into the pit and melted by the steam coils.

The defrosting process requires about 4 hr. During the recent Kentucky state fair an ice show was scheduled the night before the horse show. After the evening performance the rink defrosting began at 11:00 p.m. and was completed before 3:00 a.m. Then dirt for the horse show was hauled in and spread over the entire arena to a maximum thickness of 2 ft in time for the opening.

The mechanical equipment for the ice rink is below the floor level in a room near the rear of the coliseum. The piping from the room to the rink is in a 6 ft square concrete tunnel. The tunnel itself is insulated with 2 in. of cork board, thereby eliminating the need for pipe insulation.



CONDENSATE RETURN PIPING, above, is of wrought iron. Of the same material, but not shown, are pump discharge lines, high pressure and medium pressure return steam lines, and ice rink piping

Boiler Plant Consists of Four Package Units

The boiler room for the entire plant is in a subbasement adjacent to the ice rink equipment room. Steam is produced in three package steam generators, each with a capacity of 15,000 lb per hr. Boilers are operated at 100 psig steam pressure and are fired by combination gas and oil burners. The Louisville Gas and Electric Co. permits the use of gas for space heating if standby equipment is installed for emergency use.

Boilers are longitudinally fired, bent water tube, with steam drum and mud drum. The boilers were completely shop assembled and delivered to the site ready for service connections. The boilers are provided with forced draft fans, allowing a stack height of only 75 ft at the low point of the coliseum roof.

An additional Scotch type package boiler furnishes steam for the offices, kitchen, and dining rooms when the remainder of the buildings are not in use. This boiler has a capacity of 4300 lb of steam per hr. It is also fired by a combination gas and oil burner and equipped with a forced draft fan.

Through a concrete pipe tunnel around the perimeter of the coliseum, steam is supplied to the various connecting buildings. Steam is distributed at 100 psig pressure and reduced in each building to 50 psig or 5 lb, depending on the equipment and service involved.

The condensate is returned by means of condensation pumping units to a common 2100 gal feedwater receiver tank in the boiler room.

Fred Elswick and Associates were the architects. ‡

Photo on p. 103 courtesy Louisville Courier-Journal and Times. Photos on p. 104 and 105 courtesy A. M. Byers Co.

ELECTRONIC COMPUTING EQUIPMENT — such as this IBM 704 computer installation — has begun to free some of the most capable technical personnel in several engineering organizations from time consuming manual calculation of piping flexibility analysis

How Giant Brains Aid Piping Design

Flexibility problems that are too complex for human brains are being cracked quickly and economically by automatic digital computers. The author outlines typical current programs, describes briefly the equipment available, and explains his own program for machine calculation.

BY DR. JOHN E. BROCK
Professor of Mechanical Engineering
U. S. Naval Postgraduate School

THE USE of automatic computation equipment for solving piping flexibility problems in design is rapidly increasing. The reason is simple when you consider that, without the aid of the mechanical brain, the amount of labor involved in obtaining the flexibility equations increases approximately as the square of the number of unknowns involved and the labor of solving the equations increases approximately as the cube of the number of unknowns!

This means that all except the simplest of practical problems involve tens of thousands of elementary arithmetic operations, plus tens of thousands of decisions whether to add this quantity to this one or to that one and what to label the result and where to record it.

In two anchor problems it is possible to do this by manual computation using ordinary desk calculating machines. Usually, in order to simplify the problem and permit obtaining an answer in a reasonable length of time, various idealizations and simplifications are resorted to. For one thing, the pitch that horizontal pipe lines must have for drainage is usually neglected; this is true for manual solution and for the "giant brain" solutions as well.

This idealization involves only the slightest error and, as a matter of fact, the error is only of the same order of magnitude as intrinsic errors due to assuming that thermal expansions are "small" compared to the lengths of pipe involved. All methods of solution make this assumption of "small geometry."

However, other idealizations are frequently made which are more difficult to justify. For example, it is frequently assumed that the piping consists only of straight lengths which are joined to one another at definite angles; that is, with no bends or elbows in the con-

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The author is a member of HPAC's board of consulting and contributing editors and has written several articles published in HPAC on the subject of piping design.

figuration. This so-called "square corner" idealization does greatly simplify computational work, and in many cases the error resulting from the simplification is perfectly tolerable. But nobody knows for sure in every case that the error is truly tolerable.

In multianchor problems, idealization is frequently attempted by, in effect, breaking the problem up into a number of simpler two anchor problems, and then juggling with the results of all these analyses, trying to fit them together into a meaningful "solution" to the original problem. While some experienced analysts can and do arrive at valid answers by such a process, a very great amount of physical insight is required in order to do so, and it is our opinion that for every case where this procedure has been used to obtain valid results, there are two or more cases where inadequately experienced analysts have obtained results of dubious validity.

Pushed Into Automatic Program By 41 Unknowns

About 2 years ago we were faced with analyzing a system which involved 41 unknowns. Accurate quantitative results were required. At once we recognized that an exact solution to this problem could not be obtained in a single lifetime using manual computations, although a good approximate solution could be obtained by the "break-'em-up" procedure in the hands of highly competent — and very lucky — analysts. (Incidentally, our "exact" solution did provide a check on such an approximate solution obtained by others at an earlier date, and we have the deepest respect for the analysts who obtained this solution.)

Accordingly, we undertook to "program" the problem for solution by automatic computation equipment, in particular for the National Cash Register Co.'s general purpose electronic digital computer. The program was designed to provide flexibility of operation so that not only could the 41 fold redundant problem at hand be solved, but also so that any piping flexibility problem at all — no matter how redundant and no matter how complicated from a geometrical standpoint — could be treated. Actually the capacity of the equipment prevents handling a system having more than about 200 degrees of redundancy, but this is really no limitation in any practical sense.

This program has been in use for 2 years, and although it is still going through an evolution which is eliminating some unessential parts, adding new conveniences, and speeding up portions of the computation, it is fair to say that the program has been tested by successfully producing answers to about two dozen problems which have been analyzed during this period. Furthermore, it should be noted that most of these problems were not simple two anchor problems, but instead involved rather highly redundant structural systems.

Fortunately, the development of digital computers and procedures for their use in solving engineering problems seems to have paralleled piping developments during the past few years.

How Others Are Solving the Problem

Other individuals and groups, independently of one another, have also programmed the piping flexibility problem for automatic solution. Probably the first person to have done so is Lloyd H. Johnson of General Electric Co.'s turbine mechanical design engineering division, who described his program for using an IBM card programmed calculator in an article in the November 1954 HPAC, p. 112. Another article by Mr. Johnson, *How to Solve Pipe Expansion Problems by Punched Card Machines*, was published in the November 1956 HPAC.

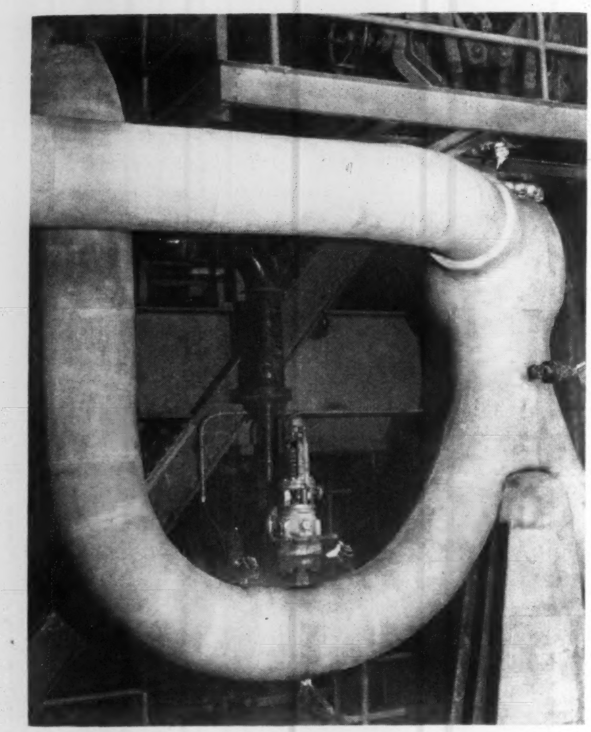
General Electric engineers have continued to develop automatic calculating procedures for piping flexibility analysis. A Knolls Atomic Laboratory report dated August 10, 1955, by K. L. Hanson and W. E. Jahsman, entitled *An Evaluation of Piping Analysis Methods*, discussed available theoretical procedures from the standpoint of their usefulness with digital computers and made use of programs for the IBM 650 computer to compare different methods. Incidentally, their conclusions included the statement: "If a digital computer is available, the Brock — matrix — method is recommended."

In the Schenectady area alone General Electric has three facilities for treating piping flexibility problems by automatic computation, two using the IBM 650, and one — Mr. Johnson's program — using the IBM-CPC computer and in the process of reprogramming for the IBM 704 computer.

The M. W. Kellogg Co. has been solving problems of this nature for about 2 years now on IBM equipment. This company has developed the "general analytical method" — originated by Shipman, Watts, and Burrows — to a highly refined state and to where it is probably the most widely used procedure today.

Midwest Research Institute, Kansas City, Mo., programmed the matrix method for calculation, using an IBM-CPC at the request of Burns and McDonnell Engineering Co., the work being done by James L. Lubkin and Y. L. Luke. This program has been in use for almost 2 years and has produced solutions to a number of difficult problems. Recently, Leon D. Findley, head of Midwest Research Institute's computing services section, reported that his company is recoding its program to use a National Cash Register Co. CRC 102A.

Probably the most widely known programming of this nature is that which was done for Blaw-Knox Co.'s power piping division by Arthur D. Little, Inc. A very interesting article describing this program appeared in the magazine Business Week for July 28, 1956. Considered by



TYPICAL INSTALLATION for which flexibility was analyzed by electronic computer is this power piping installation

some to be the most advanced and flexible program presently in use, it makes use of Remington Rand's Univac.

Right now there is a new programming effort under way. Norman Blair, who did such a good job on the flexibility task force of the American Standard Code for Pressure Piping during the past few years, and one of his assistants, Sam A. Megeath, Jr., at Bechtel Corp., are working with Virginia Palm and Charles L. Johnson of Remington Rand's San Francisco office, developing a program which makes use of smaller versions of Univac. We have been invited to participate in further development of this program, which even in its present state has already relieved the Bechtel stress analysts of a considerable burden of calculation.

Other developments are also under way in this field. Dr. E. C. Long of Oak Ridge National Laboratory has worked on the problem of using the computer Oracle to treat piping flexibility problems. Engineers at the Electric Boat Div. of General Dynamics are reprogramming their IBM 704 to use the matrix method.

Certainly many more similar developments are in progress, but these are typical. Now, each of these systems is different from the others. Some use the Kellogg general analytical method, and some use the matrix method; some use a combination of these, including developments made by the individual analysts who have been using them. Also in use, as mentioned, are several different IBM setups, two different Univac setups, two NCR-CRC 102A setups — using slightly different equipment — and Oracle. In addition to these, Arthur D. Little, Inc., is working on a coding using Datatron, another digital computer.

Naturally, it is not possible to detail all the features of these combinations, even if space were available, since evolution of programs is taking place so rapidly.

How Much Does It Cost?

"How much does it cost to treat a flexibility problem this way?" No one can give a good answer to this problem yet. Actually, a better question to ask is: "How much does it cost not to treat a piping flexibility problem in this way?"

Nobody has the answer to this question either, but most engineering managers are aware that much time and attention of their best piping men can be absorbed by the details of piping flexibility analysis right at the stage of development of an engineering project where their attention would be most valuable on other problems. The fact that so many engineering firms have been willing to invest in these programs, to purchase these computers, or to enter into rental agreements, indicates that there is an awareness that manual computation is the more expensive way to treat these problems.

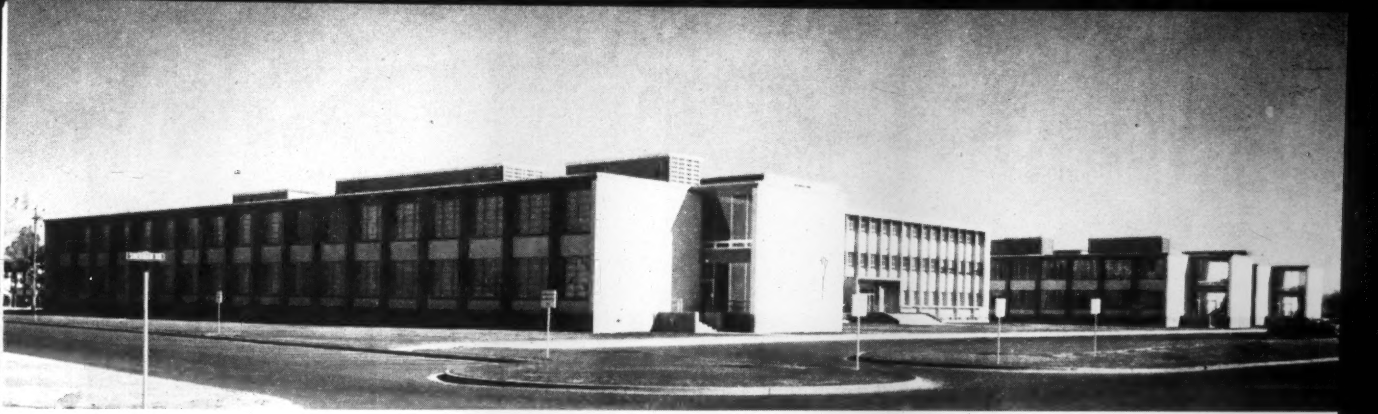
For one thing, some of the most capable technical personnel in an engineering organization must devote their attention to these problems to the exclusion of other important work. Next, in most cases it is necessary to idealize complicated problems to the point where serious doubt is cast upon the validity of the final results of the analysis. Also, the time requirements for some of the solutions by manual computation simply cannot be accommodated to the job schedule.

Investing now in these programs means that key personnel will acquire new engineering skills that will be applicable to other engineering problems as well. The man who is able to work with the computer people in programming and processing a piping flexibility problem will be better able to work with the computer people when it comes to, say, computer solution of a steam plant heat balance for various emergency conditions.

One more thing of importance is the fact that our present theoretical procedures which assume perfectly elastic behavior are, we know, only a first approximation of what happens to the actual piping in the field. Our only hope, then, of being able to deal with more sophisticated analytical procedures — which would introduce the effect of creep and stress relaxation — lies in relegating the formidable calculations such procedures would involve to automatic calculating machinery. ‡

Photo on cover courtesy Univac Div., Remington Rand; others as follows: p. 106, International Business Machines Corp.; p. 108, M. W. Kellogg Co.

In the next article, Professor Brock will discuss what computers are and how they may be directed to perform simple sequences of operations.



Low Pressure Steam, Evaporative Cooling Serve New Artillery School

BY E. W. CARROLL
Carroll & Daeuble
Architects & Engineers

Two steel firebox boilers supply 5 psig steam via underground distribution tunnels to baseboard finned pipe convectors and, in some zones, to heating and ventilating units. Sixteen central type air washer units condition over 650,000 cfm of air, providing one air change every three minutes.

THE HEATING PLANT of the U.S. Artillery School, Fort Bliss, El Paso, Texas, consists of two steel firebox boilers, each having a Steel Boiler Institute rating of 24,290 sq ft EDR. These boilers generate 5 psig steam for a two pipe, low pressure, vacuum return, steam piping system. Boiler burners are low pressure, natural gas, venturi, refractory top type. Induced draft fans are provided.

Steam piping from the boiler room is routed through separate underground distribution tunnels. Several branch distribution pits are located as required to facilitate the economical routing of the steam and condensate return piping.

Exposed steam and condensate return risers are used for vertical distribution from the basement through the third floor. Steam supply and condensate pipe lines are sized for an average pressure drop of $1/8$ psig per 100 ft.

In general, space heating is accomplished with continuous perimeter finned pipe convectors having open bottom, sloping top, steel cabinets. Exceptions to this method of heating include the auditorium dressing rooms and the interior offices on the second floor of one wing, where heating and ventilating units have been installed to handle the separate zones.

The convectors in the basement areas are mounted directly beneath the window stools, approximately 5 ft, 7 in. above the floor, to allow for gravity condensate return from the various spaces to the vacuum return header in the boiler room. All other heating elements, with the exception of certain ceiling mounted radiators, are 8 ft above the floor.

Control of the heating elements in the various classrooms, training spaces, offices, and certain other areas is accomplished with pneumatically operated radiator valves by two position type room thermostats.

The criteria used at the time of the mechanical design for the subject building required that evaporative cooling be used. Sixteen central type air washer units serve the various zones of the building wings. Each washer consists of an outside air intake and louver, automatic dampers, V-type filter bank, air washer section with recirculating spray pump, and double width, double inlet, belt driven supply fans. The total air handled by all units for the entire building is somewhat in excess of 650,000 cfm.

The increased air washer efficiency inherent in installations at the altitude of the school, together with the problem of moisture carryover into the duct system, fogging and precipitation at air outlets, and excessive humidity conditions, dictated the use of single spray bank washers, selected to limit face velocity through the washer chamber to 500 fpm.

Temperature control in the evaporative cooling system is accomplished with a two position room type thermostat in each zone of each washer controlling each water spray recirculation pump.

Exhaust ventilation systems are provided for all toilet rooms, the auditorium, and the snack bar to permit year 'round exhaust for the respective spaces. In addition, exhaust fans are provided to permit summer and intermediate season ventilation for the entire building, the operation of which is in conjunction with the evaporative cooling system. Central building exhaust fans move approximately 76 percent of the total air introduced.

About 460 hp is required to operate the air washer fans and pumps. The amount of sheet metal required for the system is over 200,000 lb. 350 grilles and outlets are used, as well as 23 exhaust fans and 285 radiators and convectors. ‡

1 YEAR 'ROUND AIR CONDITIONING is enjoyed in this church simply by manually resetting the valves to and from the ice tank and steam converter. Thermostats automatically reverse operation

440 Ton Peak Load Storage System

BY DAVID C. PFEIFFER
Consulting Engineer

Four refrigerating compressors totaling 150 tons, 19 separate air handling systems with multizone units, and a 160 plate, 80 ton ice capacity storage tank are installed in this large — 3700 members — Texas church.

The East Dallas Christian church, with a membership of 3700, was air conditioned in 1954. The peak load on the church and Sunday school is 440 tons.

The system consists of 19 separate air handling systems, some with multizone units. One building has 32 individual remote type room units, all using chilled water. The storage system consists of a steel tank 24 ft wide by 40 ft long by 7 ft, 6 in. high. The tank is insulated with 2 in. cork board on the bottom and 4 in. cork board on the sides. The tank is in a separate basement area and is not insulated on top as there is no air movement above the tank. As soon as the dewpoint temperature of the air above the tank reaches the water temperature, no evaporation will take place.

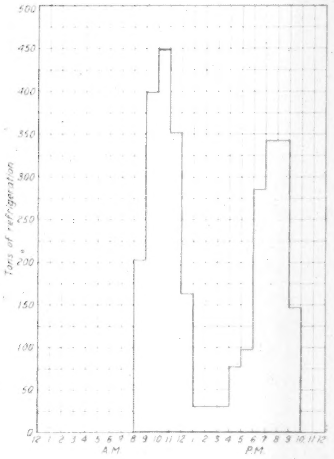
The tank contains 160 plates, each approximately 3 ft by 9 ft and each with a capacity to freeze 1000 lb of ice 4 in. thick on each side. The total ice making capacity of the tank is 80 tons, equal to 1920 ton hours of refrigeration. The refrigerating capacity available from raising the water temperature in the tank from 34 F to 50 F, based upon a normal water level of 6 ft in the tank, is 476 ton hours, making a total capacity of the tank equal to 2396 ton hours without the aid of the compressors. Capacity is sufficient to take care of the maximum Sunday load without running the compressors, so as not to increase the power demand of the church.

The plates are spaced 12 in. on centers and are approximately ¾ in. thick. This leaves a neat space of 11¼ in. for freezing the ice. While the normal capacity is based upon freezing 4 in. of ice, the capacity can be increased 20 percent by freezing 5 in. of ice on each plate if desired. Ice can be frozen to whatever thickness is the most economical for the operation of the system.

Compressor Capacity Is 150 Tons

The refrigeration plant consists of two 50 hp and two 25 hp compressors. Each of the 50 hp compressors serves 60 plates, and each of the 25 hp compressors serves 30 plates. Each of the four compressors is a separate refrigerating system so that any or all of these can operate independently from each other. The average capacity of the refrigerating system at 20 F suction temperature is 90 tons. The time required for freezing 4 in. of ice on all plates is approximately 21 hr from a water temperature of 30 F and 26 hr from a water temperature of 48 F.

Coils were selected based upon 3 gpm per ton, with entering water at 42 F and leaving at 50 F. Actual op-



2 TYPICAL SUNDAY LOAD from 8 a.m. to 10 p.m. totals 2800 ton hours of air conditioning capacity

Conditions Church

eration from this tank has produced water at a maximum of 38 F which has resulted in very satisfactory operation due to the high latent load in the church. The normal increase in temperature from the tank during a Sunday is 2 F.

The control of the ice thickness is automatic to the extent of shutting down each compressor when the ice has formed to a 4 in. thickness on the plates which it is serving. The control system does not provide for automatic starting of the compressors, as it seems inadvisable to have this much machinery starting and stopping automatically, unattended. Church attendants are responsible to see that sufficient ice has been formed on the plates to take care of the required use. Two of the compressors are started each Monday morning, and the other two on Tuesday morning. Each pair of compressors has its own condenser circulating water pump and cooling tower fan, which are electrically interlocked with the compressors so that when any one of the compressors is running, the auxiliaries required with this compressor will be in operation.

The control of ice thickness is by means of an ice bank control, which is wired into the electrical circuit in such a way that after a compressor is started manually it will not continue to run until the ice bank control switch closes the solenoid valve supplying liquid refrigerant to the plates, which will cause the compressor to "pump down" until the suction pressure switch shuts the machine down. In the basement there is a control box having four single pole, double throw switches, which are identified as the ice control switches. When these switches are in the on position, the circuit to the ice controller is closed, and the ice control will function. If it is necessary or desirable

WHAT IS STORAGE AIR CONDITIONING?

The basic principle of any storage type air conditioning system is to provide some means for storing up refrigeration during nonoperating periods so that a smaller refrigerating system can serve a larger load than its rated capacity. If, for example, one having a maximum load of 100 tons is operated 8 hr each day, it could be served either by a conventional 100 ton system or by a 50 ton refrigerating system with facilities for storing 400 ton-hr during the off-peak period. It could also be served by a 100 ton refrigerating system together with storage facilities for storing 800 ton-hr of refrigeration for off-peak periods. In the latter case, the complete refrigerating system would be operated on an off-peak basis, which would probably result in no demand charge for this equipment. In the second case mentioned above, the 50 ton plant would operate 16 hr a day, and the demand charge would probably be one-half of that for the first case or conventional system.

WHY CHURCH CHOSE THIS METHOD

The total capacity required for the church and its related facilities is 440 tons. The total expected load for a maximum Sunday is 2245 ton-hr. See Fig. 2 and Table 3. The cost for the complete air conditioning system exclusive of refrigeration plant was $135,000. The cost of a conventional refrigeration plant using electric power would be $67,800. The cost of the complete refrigeration plant for the storage system was $41,276. The annual power cost for operating the conventional electric system would be $3578. The annual power cost for the storage system was $1305. From these figures it can be seen that the increased investment for the conventional electric system over the storage system is $26,524, while the decreased power cost for the storage system over the conventional system is $2273 a year.

From the standpoint of the electric utility, even though the storage system shows a material saving in electric power costs, the utility revenue in dollars per year per kw of maximum demand is greater than either the revenue with no air conditioning or with conventional air conditioning. The actual revenue for the calendar year of 1954 with no air conditioning was $26 per kw of maximum demand. The estimated revenue for the conventional system would have been $16 per year per kw of maximum demand in spite of the increased power bill of $3578. The estimated annual revenue on the storage system is $30.31 per year per kw of maximum demand. This illustrates why the electric utilities are interested in the storage type of air conditioning, and also why it is attractive to owners.

One disadvantage of storage type air conditioning for churches is that it must be designed for a definite load curve; and since a time element is introduced, this load curve must be followed if the system is to operate satisfactorily. If there is a question as to the adequacy or accuracy of the load curve, supplementary refrigeration should be provided which can usually be done most economically by providing a tank for purchased ice which can be loaded from a delivery truck. This will be necessary for any church having conventions or a series of all day meetings, during which time the storage system designed for a Sunday load curve will not have sufficient capacity on successive days for long periods of time.

for any reason to shut the compressors down before sufficient ice has been frozen, the switch for the particular machine can be turned to the off position, which will act in the same manner as the ice control will act when it has been satisfied.

Three Pumps Circulate Water

There are three circulating water pumps, two large ones and a small auxiliary pump. On Sunday morning for cooling, the best operation is obtained by running both of the large pumps. At all other times during the week one large pump is usually sufficient for the operation of any part of the system, including the sanctuary. The small pump is intended to take care of the office area only. In order to get maximum benefit from the combination of pumps in operation, there are five motor operated butterfly valves in the various circuits. The small pump is never operated with either or both of the large pumps in parallel.

For winter operation the water circulating system is changed by manually closing the valves to and from the ice tank and manually opening the valves to and from the steam converter. This changes the piping system from an open to a closed one, in which the surge tank at the highest point acts to liberate air from the system and to allow makeup water to enter this system.

The most economical operation of the pumps is determined by reading the water temperature going to the system and returning. For summer operation the return water should be approximately 6 to 8 F higher than the supply water. For winter operation the return water should be approximately 8 to 12 F lower than the supply water.

Controls Provide Flexibility

Each of the 19 central systems has thermostatic control to maintain the desired temperature in the area served. Several of these systems consist of multizoned units where one unit serves several areas. For example, unit No. 9 serves four separate classes through four individually controlled zones. A thermostat in each class controls the operation of a face and bypass damper which permits air to go through the coil or to be forced around the coil as required. The setting of the room thermostats can be changed only by a special key so that the occupants cannot change the setting as desired. The normal setting is 76 F, but this may be altered if particular conditions require it.

In order for the same thermostats to be applicable for both summer and winter operation without a manual changeover, a temperature control device in the water lines automatically reverses the operation of the thermostat when the temperature of the water is high. Thus the control system need not be changed manually from summer to winter or vice versa.

In three units a special system of outside air control has been included which permits drawing in outside air to maintain a desired comfort condition for cooling when the temperature of the outside air is lower than the temperature at which air should be delivered to the area. This is accomplished automatically by two controls: the first consists of a bulb in the outside air, which, when the outside air temperature is below 65 F, will put into operation a second control system, which will proportion the amount of outside air and return air in such amounts as to supply the area with 60 F air.

Of course, the control equipment can be adjusted for other temperatures. For example, on a fall or spring evening a banquet may be held when the temperature outside is such as to require neither heating nor cooling. If we assume the outside temperature to be 55 F during the evening, and the internal heating from occupants, lights, etc. is such that it is uncomfortable without cooling, if the fans of units Nos. 1 and 2 are put into operation, the second control system described above proportions the quantity of return air with outside air to provide air at 60 F. This gives reasonable comfort as long as the outside air temperature remains low enough to pick up the internal heat load. This system is normally used only during the evenings with high human load such as banquets and only during the fall or spring.

The same system is included with the unit which serves the main sanctuary and is applicable during weddings or evening meetings when it is desirable or necessary to have the cooling system on. When the outside temperature is above the setting of the first thermostat, 65 F, the second thermostat is made inoperative and the five position switch on the control board will determine the position of the return damper and outside air damper, so that any desired quantity of outdoor air can be admitted.

Protect Coils From Freezing

An emergency system prevents freezing of coils. A separate control has an outside bulb so arranged that when the outside temperature is below 30 F the small circulating pump is put into operation automatically, and all butterfly valves are opened. As this condition occurs only in winter, the water is normally circulated through the steam accumulator. In extremely cold weather there is usually steam pressure on the boiler so that warm water is circulated throughout the system. Even if there is no steam available, the circulation of water in the system prevents freezing of any of the coils which might be exposed to outside air. The operation of the small pump continues as long as the outside temperature is below 30 F or whatever setting is given to this thermostat.

TABLE 1—ELECTRIC POWER COSTS for the East Dallas Christian church before air conditioning totaled $2734.89 for the summer of 1954

Month	Kw demand	Total Kwhr	Power cost
June	198	15,000	$ 567.37
July	198	17,280	586.59
August	192	17,880	579.74
September	183	19,800	578.09
October	113	17,880	423.10
TOTAL	884	87,840	$2,734.89

TABLE 2—ELECTRIC POWER COSTS including air conditioning the church for the summer of 1955 were $2874.79, compared with an estimated $3115.09

1955	Kw demand		Total kwh		Kwhr refrigeration only		Power cost	
Month	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual
June	235	172	46,130	25,140	28,380	6,960	$ 826.12	$ 566.07
July	235	205	48,410	51,900	28,380	26,320	840.48	823.51
August	229	205	49,010	30,900	28,380	12,500	835.86	661.00
September	220	205	50,930	42,300	28,380	21,800	835.36	757.11
October	147	178	33,880	32,100	14,000	14,160	602.39	633.17
TOTAL	1066	965	228,360	182,340	127,520	81,740	$3940.21	$3440.86
SUB-TOTAL (Exclusive of June)	831	793	182,230	157,200	99,140	74,780	$3115.09	$2874.79

Exhaust 4000 Cfm of Air

A system of exhaust fans removes air from the sanctuary so that an equivalent amount of outside air may be drawn in through the unit. To the left of the choir area, as viewed when facing the choir, there is a fan which draws air through a room having an opening into the sanctuary through a grille in the door. An additional fan in a room to the right of the choir, located on the second floor, draws air through the dressing rooms from the sanctuary. Since the capacity of each of these fans is approximately 2000 cfm, by operating both a minimum of 4000 cfm of outdoor air may be drawn into the sanctuary. Also, the area through which this air is drawn is kept reasonably comfortable.

Central Panel Controls System

With the exception of the refrigerating system the control of the entire system is from the main control panel. Indicating lights on this panel indicate instantly which units are in operation.

The control of the compressors cannot be accomplished from this board, although it is not necessary to go to the subbasement to know whether or not the units are running. Equipment controlled from this board includes the three pumps, all 19 air handling units, the remote control button for individual units, and the control of the two air handling units of the Children's building.

Operating Cost Below Estimate

The actual operating cost for the summer of 1955 was $500.35 less than estimated. This is partly because the system was put into operation on June 12, 1955, for the sanctuary only, and additional Sunday school areas were added each succeeding Sunday. The total capacity was not available until the middle of July. Therefore the June readings are meaningless. If we neglect the June readings, the actual operating cost was $240.30 less than estimated.

Submeters measured the actual kwhr for the refrigerating system only, not including chilled water pumps, fans, etc. These showed an actual usage of 74,780 kwhr. The actual cost for electric service for the summer of 1954 was $2734.89. The actual total cost for the same months of 1955 was $3440.86, showing an increase of $705.97, which could reasonably be charged as the cost for operating the air conditioning system for this period. One reason for this remarkable low cost is that the system was operated entirely during off-peak hours, and there was no demand charge for the refrigerating plant of the air conditioning system. ‡

TABLE 3—TYPICAL SUNDAY OPERATION from 8 a.m. to 9 p.m. is shown here in ton-hr for the various units and the areas they serve

Room	Unit No.	8	9	10	11	12	1	2	3	4	5	6	7	8	9
Men's bible class	1, 2	30	54	54	32	16	0	0	0	16	16	32	16	16	8
Sanctuary	3, 5		50	100	138	74	0	0	0	0	0	50	128	128	64
Sunday school	4	4	5	5	3	1.5	0	0	0	0	0	0	0	0	0
Old Building No. 1															
Ground floor	6	25	44	44	24	12	12	12	12	24	24	24	24	24	12
First floor															
Office															
Elder's room, library, etc.	7	5	6.4	6.4	3.4	1.7	1.7	1.7	1.7	3.4	3.4	6.4	6.4	6.4	3.2
Chapel	8	6	15	15	8	4	4	4	4	8	8	15	15	15	7.5
Parlor	9	8	18	18	9	4.5	4.5	4.5	4.5	9	9	18	18	18	9
Second floor	10, 11	37	61	61	41	20.5	0	0	0	0	0	0	0	0	0
Building No. 2															
Basement	12, 13	16	28	28	16	8	8	8	8	16	16	20	20	20	10
First floor	14, 15	10	17.5	17.5	11	5.5	0	0	0	0	0	10	10	10	5
Mezzanine	16	8	12	12	8	4	0	0	0	0	0	8	8	8	4
Second floor	17	12	20	20	14	7	0	0	0	0	0	12	12	12	6
Mezzanine	18	12	18	18	10	5	0	0	0	0	0	15	15	15	7.5
Totals		173	348.9	398.9	327.4	163.7	30.2	30.2	30.2	76.4	76.4	210.4	272.4	272.4	136.2
Total Ton-hr,		2556.7													
Primary building		30	50	50	25	0	0	0	0	0	20	25	20	20	10
Totals		203	398.9	448.9	352.4	163.7	30.2	30.2	30.2	76.4	96.4	235.4	292.4	292.4	146.2

Total ton-hr, including primary building, 2806.7

Use 80 percent diversity factor = 2245 ton-hr. This will be used for design purposes.
Maximum instantaneous total = 438.9 tons.

Maintenance Job Is Changing Fast

With the maintenance job getting bigger and more complex all the time, experts in all types of industries gathered recently to survey the changing picture. New advances in technology, increased production capacity, and the growing shortage of qualified trained personnel are among the presently acute problems voiced at the eighth annual Plant Maintenance and Engineering Conference in Cleveland.

The changing pattern, the experts emphasized, creates new problems. Their solution requires real teamwork, more effective planning, new techniques and tools, and more adequate training programs. Here are some of the highlights in the speakers' own words. Other abstracts were published in the April HPAC.

• *fully stocked valves and fittings avoid repair delays*

“Our total plant employment is about 1200, and engineering strength is almost 20 percent,” said G. Standish Beebe, plant engineer, Chas. Pfizer & Co., Inc., Groton, Conn., chemical and pharmaceutical manufacturing organization. “Of course, we bring in outside contractors for large maintenance jobs and to help with annual shutdown.

“After several years of development in the trades, we find ourselves in the position of having many men who have demonstrated their ability to handle the assignments of the top rated mechanic but are held back in a lower rated position because there are not enough jobs calling for first class men available. For some time now, we have abandoned the policy of hiring more experienced mechanics for expansion or replacements, preferring to promote from the trade those who are qualified for advancement.

“Of nearly as much importance as having the skilled mechanics, foremen, and engineers, is keeping available necessary materials, tools, and equipment and the spare or replacement parts required to properly maintain our chemical plant.

“Being a little farther away from the large metropolitan areas than are some other plants, we tend to keep somewhat more mechanical stores on the premises than perhaps might be indicated by the size of our operations, and our total mechanical inventory runs to about $1½ million.

“We have a large mechanical stockroom employing five men full time, and several smaller stock areas. Our mechanical stock consists of a complete line of steel, brass, and stainless steel pipe and fittings and selected sizes of galvanized steel, cast iron, plastic lined, and rubber lined pipe and fittings.

“In general, the stock of steel is screwed, using 2000 lb forged steel fittings up to and including 2 in. and all beveled ends for welding above this size. Brass is stocked in both screwed and silver solder types, with a 4 in. size limit on both. Stainless steel is kept in stock up to and including 4 in. in Schedule 10 for welding and in much lesser amounts in Schedule 40. We attempt to discourage the use of the heavier weights and would much prefer to order the materials as needed when we are forced to use the 40, 80, and so forth on special pressure or corrosion trouble spots.

“We do keep a good supply of valves, both globe and gate and other types and have pretty well standardized our valve usage. Since we do most of our own valve repair work and keep a full stock of replacement parts, it is a great advantage to have as few manufacturers' products and figure numbers as possible. Frankly, a good many years of experience and a lot of thought and discussion preceded the ultimate selection of our standard valves.

“Along with our stock of pipe and fittings we try to keep just ahead of the demand for certain sizes of structural shapes in both steel and stainless and very special sizes of other metals. Of course, because of its greater expense, the quantities of stainless steel are watched more carefully and much fewer sizes of stainless steel pipe and fittings are stocked. First and last, though, in our type of manufacturing, the preference seems to be for stainless steel.

“The most universally used stainless steel in this plant is Type 316, an 18-8 stainless steel with 2 to 3 percent of molybdenum added to the alloy, although we find many commercially stocked items readily available in Type 304, a very similar alloy without moly and ordinarily about 15 percent lower in cost. Although there are some particular trouble spots where we must use the more corrosive resistant and more expensive, Type 316, there are many places where 304 is good enough.

"Because we are attempting not to stock two complete lines of pipe, valves, fittings, bolts, and so on, we have pretty well standardized on the Type 316. Notable exceptions to this practice are bolts, nuts, washers, screws, cotter pins, and so on, where higher price and much longer delivery of the Type 316 make it practical to keep our bins filled with 304. Because of this we occasionally must put off doing a job awaiting delivery of Type 316 materials, but this is very infrequent," Mr. Beebe said.

• *standards book helps save on purchasing*

"WHERE CORROSION is an important factor and the quality of the product may be adversely affected by contamination from corrosion, formal standards are a must," said Herald A. Burns, manager of production engineering department and shops, Ansco division, General Aniline & Film Corp., Binghamton, N.Y.

"To operate and maintain a plant the size of Binghamton" - - 4000 employees, where photographic film, paper, chemicals, cameras, and accessories are manufactured — "we must have standards and consistently adhere to them.

"We have a standards book and many other standards under consideration which we hope to incorporate in it later. There seems to be no end of the things which should be in our standards book rather than depend upon the memories of the engineers, designers, and foremen.

"When a standard is to be added to the book, or a major revision is to be made, the proposed new standard or change is tentatively made up and sent to the interested persons for review. Three or four days later a conference is called. These conferences usually include the chief engineer, plant engineer, the design group leader, and area engineers who are particularly interested in the item under discussion. Other very important members of the conferences are the shop and craft foremen who are working with these materials day in and day out. Quite often the actual field experience of the item, as observed by the foreman, is the deciding factor as to which product will be selected as standard.

"An example of such a standard is our standard for valves, which provides a first and second choice. We spent considerable time on this standard as valves represent a large expenditure of dollars over the years, both from the first cost and the maintenance cost. We obtained quotations on comparable valves and a cost comparison was made. Using this cost comparison and evaluating our actual field experience with the different makes of valves, the selections were made.

"This standard was established many years ago, and it was revised again last year. We found that we were buying unnecessarily high priced valves for many uses, as there were many lower cost valves on the market which would give satisfactory service and were stocked locally.

"Another similar investigation was made on pipe unions. Again we changed manufacturers due to cost comparisons. The savings on the purchase price alone more than paid for the engineer's time who is working on this standards book. These cost comparisons are made at regular intervals to be sure that we are getting the most value for our money.

"However, as a word of caution, it is impractical to change suppliers each time one of them announces a price change. This would defeat the whole idea of having standards. For instance, valves manufactured by various companies have different face to face dimensions, which make replacement with a different manufacturer's valve very expensive. Also, the more makes of valves which we have installed, the more money we must tie up in repair parts.

"There is no short cut to setting up standards for a maintenance and construction engineering department. The only way to establish and maintain this important aid is to pick a competent engineer who is familiar with the various phases of construction and maintenance, assign him to this job, and leave him on it. Setting up standards and keeping them up to date cannot be done economically or efficiently as a 'fill-in' job," concluded Mr. Burns.

• *pipe replacement is big item in foundry*

"THE FOUNDRY INDUSTRY today realizes the need of keeping pace with the advanced technology required to meet the ever changing demands of our customers," said S. A. Simonson, plant engineer, Chicago Hardware Foundry Co., North Chicago, Ill.

"Several years ago we installed a pneumatic sand conveying system. We wanted to distribute sand to molder stations quite a distance apart and not in line so the layout was not suitable for a belt installation. In the original installation short radius curves were put in from the transporter and our sand stoppage in these pipes was serious. To eliminate this trouble we had to revamp the layout and install long radius curves.

"The replacement of the pipe is the big item in the maintenance of this system. The abrasive action of the sand at high velocity wears out the pipes and curves in several months time. We have tried ni-resist cast curves but it is difficult to get these to fit properly and there is the danger of breaking the flanges if the alignment is not right. We are now using a clamp type joint which makes the replacement of the sections of pipe easier than the bolted flanges formerly used.

"The switches in our system use rubber hoses which wear out at the moving end. The solenoid valves, relays, and switches in the control require little maintenance," he said.

• continuous operation poses special problems

Maintenance problems in a continuously operating phenol plant were discussed by Joseph B. Littler, plant engineer, Durez Plastics division, Hooker Electrochemical Co., North Tonawanda, N. Y.

"Of necessity, two shutdowns per year are scheduled," he said. "One is for cleaning some 560 tubes — 1½ in. × 20 ft — in each of eight vertical heat exchangers. During this four to five day period, as many inspections and repairs are scheduled on other equipment as time and labor permit.

"Inspections are made at this time to determine the extent of repairs necessary during the second shutdown, which lasts two to three weeks. The longer work items are saved for then if possible.

"Thorough inspection requires draining of much equipment. This causes some loss of product, even though all material possible is drummed or pumped to storage.

"Welding, especially, requires elaborate preparation and segregation of the area involved. Even then, welding in position is permitted only if repair is impossible by any other means, or if the equipment cannot be removed to a safe area.

"Sometime prior to each of the scheduled shutdowns, a complete work list is made up, including repetitive cleaning and inspection, projects awaiting final tie-in, replacements, and the accumulative repairs.

"These items are put into categories according to correlated groupings of equipment such as that pertaining to acid evaporators, ducts, steam supply piping, and glass and porcelain lines. Service headers or mains for steam, air and cooling water are listed separately.

"Many types of repair cannot be scheduled without shutting down the plant. At other times we must make stop gap repairs, such as winding a cracked valve with glass tape and epoxy resin. The valve is then replaced at the first opportunity.

"It is sometimes possible to take advantage of interruptions in electrical service, although extreme caution is necessary.

"In case of a prolonged failure, such as a crack developing in the superheater tubes, as much work is carried out as can be done concurrently from the accumulative lists.

"Stop gap repairs are sometimes very simple and enable replacement scheduling. One involved the insertion of a rubber air hose into a vertical benzene condenser tube on the water side. Cooling water had been leaking into the benzene, or process, side which was under a partial vacuum. Circumstances prevented isolating the condenser, one of nine units operating in three parallel rows. The vacuum pulled the rubber hose against the tube wall, the benzene swelled the rubber and it held for several months, long enough to obtain a continuous 155 day run.

"The mechanical department checks traps once a week. Each fall, all impulse type traps used on steam traced and insulated lines are removed and rebuilt. Large traps are bypassed to make repairs. A continuous record of all traps is kept including the service condition and correct orifice sizes.

"On weekends, mechanics tended to use any convenient orifice in a trap expecting it to work, or to change traps without checking the orifice assembly. This situation has greatly improved since the trap listings were recorded.

"All porcelain and glass lines are inspected by a competent mechanic every two weeks, using a check list that includes all installed glass and porcelain lines. About 10 percent of the procelain has been in use since the plant was built. The plant contains approximately 1300 ft of glass and 2850 ft of porcelain pipe. Glass is stocked in sizes up to 4 in. and porcelain from 2 in. up to 8 in.

"The hardest problem is to decide what to do when a leaking gasket, a cracked valve, or split piece of porcelain is found and yet maintain production.

"As mentioned earlier, it is often possible to tape, or bypass, or even temporarily shut off a line.

"We now use more flexible couplings for glass and porcelain lines, especially at the pumps. Under some conditions we must let a leak drip into a bucket filled with lime until a shutdown comes when we can make a permanent repair.

"All lubricated equipment is checked on each shift by the oilers, who have acquired a sixth sense for trouble. At night they report to the operating supervisor and on the day shift to their foreman. Actual repairs are handled by the shift mechanics from work orders. The maintenance engineer maintains a daily log sheet on the operation of the second stage prime mover, a turbine operated blower rated at 22,000 cfm at 100 in. water gage. This is checked daily because tars from the process vapors accumulate on the blower wheel and in the scroll, impairing efficiency and requiring a gradual increase of blower speed for constant flow. Also, vibration, which increases to a predetermined maximum allowable figure, is checked daily with a portable vibration displacement indicator. When either maximum allowable blower speed or maximum vibration is reached, the spare blower is put into service.

"The fouled blower is taken apart and cleaned. The wheel is sent elsewhere for cleaning, inspection, and magna fluxing.

"The maintenance engineer or his assistant spends one to two hours each morning checking various other known trouble spots. All fans and blowers are regularly checked for vibration. A very valuable tool for inspection is an auditory gage for checking metal thicknesses. Several times this has revealed that a very thin wall has developed in a tank while in operation, enabling us to know that a replacement must be ready at the next scheduled shutdown.

"We have also avoided several unnecessary replacements by determining that an apparently weak wall was confined to a very small area. A large copper condenser had a small hole through the shell. Using the gage, we found the wall thickness, everywhere we checked, to be almost normal. Later we found the hole resulted from an arc burn inside the unit, made when the tube supports had been installed.

"Based on inspections and failures, we have listed the expected mortality of various units. From this we can predict fairly well just when a preheater needs a new set of coils and are prepared when it comes off the line for cleaning.

"One source of never ending trouble is our 130 pumps in various sizes from a few gpm to 1500 gpm. Forty-eight operate in pairs, of which 24 are installed as standbys. These critical pumps are watched closely to spot trouble but all pumps except carbon pumps are switched every two weeks, insuring better continuity of operation. However, sometimes we must switch operation right back to the former pump in order to repair the spare.

"Many alarms and indicators on a central control board in the plant office building indicate trouble, such as low oil flow to the turbine and blower bearings, but all personnel are continuously alert for trouble.

"Standing inspections are made in whatever way possible when the plant is down. Recently we changed the impeller on a 200 hp blower. We had been waiting for a power failure to develop so we could find the source of vibration. Finally, it was necessary to curtail operations about 50 percent and during a short interval stop the blower, change the impeller, shim the bearing in the housing and restart. We did this with about 10 minutes to spare.

"Main inspections are made during regularly scheduled shutdowns. The brick lined equipment is checked and a report is issued covering conditions found, repairs made, and recommendations for the next shutdown.

"All vertically installed heat exchangers, condensers, and evaporators are tested for leaks during each shutdown, by filling with enough water to cover the top tube sheet and then using up to 10 lb of air pressure on the shell side.

"Depending on the anticipated remaining life, several tubes may be pulled out to check on tube thickness or pitting but this is not always a good solution. During the last shutdown of one evaporator we found the pulled tube to be in excellent shape. Two weeks after starting up we had to shut down this unit again to reroll about four leaking tubes, apparently loosened from replacing the one tube, although the unit had been retested.

"In another case, a vertical monel condenser, which condenses dichlorobenzene from a tar still has been failing in the coldest group of tubes — those which are in the first cold water pass — which is the most critical area since it is cool enough to condense water vapor containing acid from decomposition of chlorobenzene.

"The pressure units are regularly checked at 1½ times the operating pressure. A printed check sheet is very desirable, reminding one to carefully inspect everything. It is also excellent for future reference or for proof that a certain item was field checked. These are filed in respective equipment folders.

"Several times we have found lugs and nozzles in the wrong places. We also check with the operating department since for years operating personnel may use a valve that's hard to reach, or a gage glass on the wrong side, or a handwheel just under a beam. It is easy to make minor adjustments during replacements and at the same time earn the thanks of the plant operators.

"About three years ago our 14 in. underground water line began giving trouble. The water contains both salt and hydrogen sulfide. The line had been coated both inside and outside with an asphalt coating and even protected in some areas with cathodes. Repairs had to be made during operation which involved digging and shoring a large hole in sandy soil while one or more pneumatic sump pumps kept the water down. After much checking it was decided to replace the line. Since the original installation was made, additional buildings and roadways had covered the line. Replacement of the underground line would take too long during a shutdown and would disrupt transportation facilities. It was decided to construct an insulated overhead line coated inside. The work was completed to the final tie-in before the next shutdown.

"One of our biggest problems is finding leaks in high volume equipment with operating pressures ranging from −40 to +40 in. water gage. It is extremely undesirable to fill the equipment with water since there is insufficient time to dry the equipment. One such case is the catalyst chambers which are tested with the catalyst in place. We now fill with air ranging from 20 in. to 40 in. WG, turn off the fill valve and observe the rate of pressure drop on a manometer. This takes considerable time since we must wait until the air is at a temperature in equilibrium with its surroundings.

"But the biggest job is finding known leaks. This requires gradually removing insulation from all joints, both bolted and welded, and then soaping the joints. We have had little success with listening devices. A portable leak detector requires materials which the operating department does not wish to have enter the system, nor is the detector of an explosion proof design. We are looking for a material that would be apparent when leaking and then be harmlessly dissipated. Steam would do this, if it didn't wet the catalyst and insulation," he said. ╪

New Electric Heating, Cooling Developments Marked at Conference

New developments in the electric air conditioning and heating field were presented to over 170 architects and consulting engineers from nine states during a two day symposium in Roanoke, Va., recently.

The symposium, believed to be the first of its kind, was sponsored by the Appalachian Electric Power Co. in cooperation with eight of the leading manufacturers of air conditioning and electric heating equipment in the U.S.

During the conference, engineers representing the manufacturers presented papers on electric air conditioning and heating, and architects and contractors gave installation stories. HPAC presents here excerpts from several papers of special interest to heating, piping, and air conditioning engineers and contractors.

Electricity to Heat School for 1200 Pupils

. . . biggest Midwest installation

EXPERIENCE in electric resistance heating of schools, in particular the new Penn Township high school, in Indiana, was discussed by Charles W. Cole, Jr., of Charles W. Cole & Son, architects & engineers.

He said, "We have found electric heating of school houses a practical method and suggest that our clients consider the electric method as well as the conventional methods, and then let them make their choice.

"The $3½ million Penn Township high school will be the largest school in the Midwest heated entirely by electricity. We do not feel that 'size' has any bearing on the electric heating problem or method, except that the local utility company should have the capacity at the building location to furnish the energy and demand at an acceptable rate.

"This school was designed for a 1200 student load, with 47 teaching stations, an auditorium, swimming pool, and a gymnasium that will seat 3100. The total cost of the electric lighting, power, and heating installation was 18.95 percent of the total building construction cost.

"In comparison, in four other schools with another type of heating system, bids taken subsequent to the Penn Township high school show that electric lighting, power, and heating installations ran from 4.55 to 8.42 percent higher.

"All classrooms in the Penn Township high school are heated with standard unit ventilators, equipped with electric heating elements and automatic dampers with control for night setback, and minimum and maximum damper operation for both ventilating and cooling requirements. The auditorium, swimming pool, and gymnasium are heated with the larger auditorium type unit ventilators with the same control features as the classroom type. Indiana's code requires a minimum of 7½ cfm of outside air per pupil. Corridors are heated with forced air type convectors or unit heaters, with the exception of the main entrance lobby where, due to snow and slush, radiant floor heating will be installed to keep the floors dry, in addition to heating the space.

"As to operating costs, electric versus oil, we feel with the present cost of oil in our community and the present available rate for electric heating, along with all other factors involved, that the overall cost of operation and maintenance for either system will be about equal," he said.

Interest in Commercial Space Heating Rises

. . . reasons listed

COMMERCIAL space heating by electricity — including schools churches, motels and hotels, hospitals, offices and apartments, theaters, restaurants, and other nonmanufacturing locations — was discussed by C. F. Kreiser, of the Edwin L. Wiegand Co.

He said, "While we know of such complete space heating jobs dating back 25 years, it's been in recent years that interest has been heightened. There are several reasons:

"1) Substituting kilowatt hours for man hours.

"2) Limited hours of occupancy.

"3) Ideal for remote locations.

"4) A 'current expense.'

"5) Commercial rates economical.

"6) Distribution capacity available.

"7) Uniform comfort obtained."

In addition, Mr. Kreiser listed six other benefits of electric heating:

"1) Lower initial cost.
"2) Safety.
"3) Cleanliness.
"4) Flexibility.
"5) Negligible maintenance.
"6) Efficiency."

Don't Assume Economy Is Principal Feature

. . . of electric school heating

THE ELECTRIC heating installation for another Indiana school — the Parkside school, Hartford City, Ind. — was reviewed by Robert L. Boyd, development engineer, Electromode Div., Commercial Controls Corp.

This electric heating system was previously described in detail by Mr. Boyd in two articles in the December 1955 and December 1956 issues of HPAC.

At the conference he said, "Do not assume that economy is the principal feature of the electrically heated school. It is important, and the traditional arguments are economic, and no other significant question is generally raised against it. Much of the discussions are on this point. But the better insulated school results in greater comfort, summer as well as winter. The automatic trouble free performance is a source of satisfaction to administrators and dollar savings to taxpayers. The cleanliness of the system is appreciated by the neighbors, the teachers, the parents, and perhaps even the school children. The safety is appreciated by everyone."

He concluded, "There is no question that schools can be heated electrically today: we may not be able to afford to heat them otherwise tomorrow."

High Air Quantity Is Heat Pump Advantage

. . . defrost is control problem

THE HIGHER THAN NORMAL air quantities used for heating with a heat pump are not a problem but an advantage in terms of comfort control and system design," said W. E. Hood, of the Carrier Corp.

"Delivering 90 to 100 F air into a room for heating purposes," he said, "has been looked upon as low grade heating performance but a necessary requirement for heat pump use. This is not correct and, in fact, the low temperature rise characteristic of heat pumps is an inherent advantage both from an application and a performance standpoint.

"This concept was first published in an article in the April and November 1953 HPAC Journal Sections, *Distribution of Air Within a Room for Year 'Round Air Conditioning*, by S. F. Gilman and H. E. Straub, reporting research at the University of Illinois. Investigating the performance of outlets and outlet location for year 'round heating and air conditioning, they concluded that several types of outlets and several possible locations are satisfactory for heating only and, conversely, other types and other locations satisfactory for cooling only. They found that outlets mounted in or near the floor, producing a vertical primary air outline with little spread was particularly applicable to year 'round systems using a high flow rate and low air temperature differential. Furthermore, in commenting on the heating performance of this type outlet, the report adds, 'A high flow rate and low supply temperature resulted in the most acceptable distribution.'

"The location of the return air grille was also studied as part of this investigation, and it was revealed that the location of the return air grille is not important if the supply outlets are properly located and provide proper distribution and room air movement for the heating or cooling function involved, or both. Return air grille location can help to improve some of the less satisfactory supply outlets."

Mr. Hood also said, "Night setback, with heat pump installations, is not desirable and should be avoided. Because heat pumps are usually sized to closely match the heating requirements and because air source heat pumps lose capacity with declining outdoor temperatures, there is little reserve capacity for bringing the temperature back to normal after night setback.

"A control problem unique with heat pumps," he said, "insofar as heating practice is concerned is that of defrost requirements. On an air source heat pump, whenever the outdoor temperature drops below about 40 F, the surface temperature of the outdoor coil will drop below the freezing point, and frost will start to accumulate on the coil surface. When it accumulates to the point where it severely interferes with the performance of the outside coil, it is removed by reversing the cycle and operating the outdoor coil as a condenser for a brief period of time.

"The problem is to sense when defrost is required and also to sense automatically when the defrost operation has been accomplished and a return to normal heating operation can be made. Obviously, the defrost cycle must be made as short as possible since no heating is being done during this period and, for the same reason, defrosting should be accomplished as infrequently as is compatible with satisfactory outdoor coil operation.

"Three basic approaches to this problem have been used," he said. "These are a pressure sensing device responding to increased airway resistance across the outdoor coil, a control sensing the difference between outside air temperature and suction temperature — or pressure — and third, a straight timed cycle. A combination of several of the above methods is also used.

"Frost buildup on the outside coil on a heat pump occurs at its most rapid rate during outdoor temperatures between 30 and 40 F. Under these conditions, the outdoor air has considerably more moisture in it than does air at lower temperatures. Actually, at extremely low temperatures, the rate of frost buildup is very low and the frost is in the form of snow rather than ice, which is much more easily removed. The severity of frost accumulation at mild conditions means that the defrost problem is one which must be considered for almost all heat pump applications regardless of geographic location and, as a matter of fact, is accentuated by the milder climates of the South," Mr Hood said. ⌗

How to Increase Efficiency Of Plant Piping Systems

BY ROBERT J. PINSKE

17. *Efficient Steam Piping Requires Adequate Trapping*

FEW STEAM SYSTEMS can be efficient without a satisfactory trapping system. A large percentage of the money spent for higher boiler efficiencies and modern steam equipment can be wasted by an inefficient or improperly sized trapping system. The function of efficient trapping is to automatically drain condensate and air from steam piping and steam heated equipment as rapidly as it accumulates, but without the waste of steam.

By keeping the equipment constantly drained of condensate and air, the equipment is kept full of steam with no space given up to condensate or air which would reduce the physical size and capacity of the equipment. The maximum steam temperature, obviously, is desired at all times, but a steam temperature reduction will take place if all the air is not eliminated from the piping system.

The steam temperature reductions caused by various percentages of air in the piping system are shown in Table 1. It is readily observed that with the formation of air in a steam piping system, the temperature of the steam falls off quite rapidly with a corresponding increase in operating cost.

Under certain conditions, as little as ½ percent by volume of air forming a film on a heat transfer surface will reduce the efficiency by 50 percent.

The complete plant piping system should be inspected along with production records to obtain data on whether there are sufficient traps in the system, and if they are of proper size and are correctly located, with proper piping and valving used. To help prevent dirt, scale, rust, and chips from reaching the valve parts of the trap, it is advisable to install a strainer ahead of the trap. A check valve must also be installed between the trap and the return line to prevent the condensate from flowing back through the trap and flooding an idle piece of equipment.

The major point of application for new traps, or the inspection for the proper installation and capacity of existing traps, is on boiler headers. The proper traps are necessary to drain any carryover from the boiler, as well as the condensate caused by the radiation losses, in order to provide dry steam for equipment and to prevent water hammer. Other equipment to be drained includes: purifiers, separators, mains, piping headers, risers, and drip legs ahead of automatic valves and prime movers.

The author has observed in many plants where management was trying to reduce piping expenditures by connecting a number of steam consuming units and boilers to a single trap. In every case examined, the equipment was not working properly. The condensate and air were failing to reach the trap. This is due to the fact that any difference in condensate rates will cause a difference in steam pressure drop in the various units.

Even a pressure differential too slight to be indicated by an ordinary pressure gage will permit the backflow of steam from a higher pressure unit to a lower pressure unit, thereby impeding the removal of air and condensate. The result is sluggish heating, reduced temperatures, lower production, and fuel waste.

In the majority of these cases, where the installation was obviously wrong, management was complaining about the increase in fuel consumed and the poor quality of piping equipment available. The benefits of using one trap for a number of steam consuming or steam generating units will offset the moderate additional cost of using several small traps instead of one large one.

The proper trap, correctly installed and of the proper size, will contribute to more economical operation of the industrial plant. The consumption of fuel will also be reduced through the elimination of radiation losses in the return lines and re-

TABLE 1—STEAM TEMPERATURE REDUCTIONS caused by 60 F air at various pressures admixed with steam are shown here for five representative steam pressures

Steam pressure, psig	Steam temperature, F, with no air present	Temperature of steam mixed with various amounts of air at 60 F, percent air by volume 10	20	30
10.3	240.1	234.3	228.0	220.9
25.3	267.3	261.0	254.1	246.4
50.3	298.0	291.0	283.5	275.1
75.3	320.3	312.9	304.8	295.9
100.3	338.1	330.3	321.8	312.4

The author is sales manager, heating and industrial division, Warren Barr Supply Co.

Previous articles by Mr. Pinske on industrial piping maintenance have been published in the November and December 1956 *and January, February, March, and April* 1957 *HPAC's.*

ceivers. The maximum output will be maintained, with fewer man-hours, when the equipment heats up rapidly and operates at peak temperature. Efficient trapping will also minimize the expense of trap maintenance and it will reduce the frequency of costly shutdowns for repairs.

Another commonly overlooked factor is that eliminating steam waste will, in some cases, eliminate the need for greater boiler capacity, and give more efficient machine performance, which makes possible greater output without additional equipment. The importance of efficient operation of steam traps cannot be overemphasized, since their failure to function correctly will directly affect production and cause considerable monetary loss.

The installation and proper maintenance of traps in the air piping system is also of extreme importance. Traps in the air lines are necessary to remove condensed moisture and oil from the piping system.

Installing traps in the lowest possible locations will prevent the water and oil from being carried over into the air tools or compressed air operated devices where it is very harmful. Additional traps and separators are required at compressors, intercoolers, and aftercoolers. However, entrained moisture occasionally carries through in the hot, humid summer season, and it is necessary to install moisture traps at the entrance to a few of the air tools to eliminate excessive wear and maintenance.

In order to insure adequate maintenance of every trap, it is important that suitable records of trap maintenance be kept. These need not be elaborate. A card file having a separate card for each trap is convenient. Each card should be numbered, and a metal tag bearing the same number should be attached to the trap with wire. This number should be the trap location number, not the individual trap when purchased. Whenever a trap is removed from service and replaced with a new or reconditioned trap, the location number tag should be attached to the replacement trap. Each trap record card should bear the date on which the trap was originally installed, as well as the dates of all subsequent tests, repairs, and replacements.

A separate section of the file, or a separate file, should be kept for the cards relating to each maintenance period. For instance, traps in severe service should be tested every three months, or oftener, if tests show this is necessary. Traps in ordinary service should be tested at six month intervals, and heating traps should be tested once a year, preferably during the period when the heating system is not being used. Keeping the cards separated in groups this way will simplify the work of handling maintenance on each group of traps.

18. Provide Adequate Drainage of Pipe Lines

Condensate, if not removed from all low points in a piping system, will usually induce an accumulation of difficulties. Resultant water pockets introduce corrosion, water hammer, restricted steam flow or the complete stoppage of steam flow. These conditions, in turn, often cause cracked castings, leaking valves, damage to the machinery, and a loss of steam.

A common difficulty in most plants is the condensate that will collect above valves that are installed in vertical lines. If an installation like this is absolutely required, there should be a small blowoff valve right above the vertically installed valve to drain the condensate.

The remedies for the removal of condensate, to be effective, must be thorough and adequate. Steam lines must be hot and dry. Any condensate in the system, at any point, and in any volume, is a hindrance.

Drainage must be provided, at all low points in the system. Whenever the drainage is inadequate, the coils, heaters, kettles, and other steam heated equipment are slow in starting. They suffer recurrent periods of lowered temperature as the condensate accumulates, and will, in all cases, put a serious and costly burden on production.

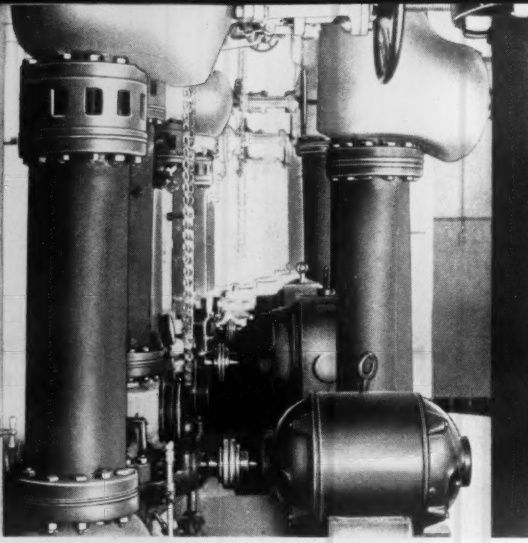
To guard against this, it is necessary to check the time required to bring kettles, heaters, and coils up to operating temperatures. The constancy of the temperature must be investigated. If it is not constant, the traps are too small in size or number, and must be checked for sufficient capacity at the time of starting, for peak operating loads.

The loss of condensate by blowing the drains to the sewer or to the atmosphere is an exceedingly wasteful practice common to a large number of industrial plants. The loss of pressure in condensate discharge lines from traps means the loss of heat, and the heat in the condensate is as valuable as the water itself.

To eliminate this form of waste the condensate should invariably be piped back to the apparatus requiring hot water, or to the boiler, because the condensate is actually distilled water, and therefore is valuable for boilerfeed use. When used for this purpose, it will reduce heat losses, save the cost of makeup water, and greatly reduce the fuel bill.

All condensate and exhaust steam now being wasted should be reclaimed if possible because it can be compared to the burning up of dollars. Oil separators should also be installed to purify the condensate and exhaust steam of oil content, where condensate is returned to boilers, or where the steam is used as a heating medium. Failure to do this will result in priming and foaming of boilers with the possibility of water entrainment in the steam carried over to machinery which can destroy the equipment quite rapidly. A mechanical separator will also reduce the amount of chemicals required to treat and remove the oil in a water softening system. ‡

Other articles by the author on piping maintenance will be published in future issues of HPAC.



1 FLEXIBLE RUBBER PIPE — wire reinforced and fabric wrapped — reduces noise transmission, isolates vibration, and absorbs water hammer in this battery of chilled water pumps in the Chrysler building

How to Control Vibration In Office and Apartment Buildings

Effective noise and vibration control media in modern, multistory air conditioned office and apartment buildings permit placing heavy equipment in critical areas. Upper floor installations are not uncommon today, even in older buildings with modernized air conditioning systems. Proper vibration control reduces tenant fatigue, irritation, and complaints, and lengthens equipment service life.

BY T. R. FINN
President
T. R. Finn & Co., Inc.

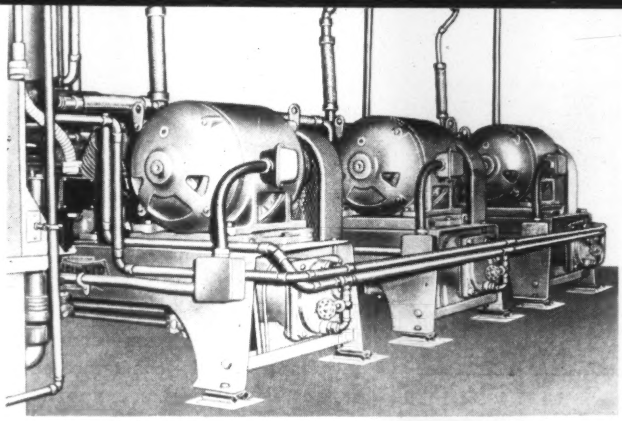
CONSTRUCTION techniques so popular in today's modern buildings have, in effect, made them "shells" to house the various mechanical equipment that supplies heat, air, water, and electricity. As a result of the steadily increasing use of mechanical equipment within these buildings, the problem of vibration has assumed serious proportions.

Mechanical equipment creates vibrations, the building structure transmits them, and irritated tenants reach for the phone. Committees of the American Society of Heating and Air-Conditioning Engineers and the American Society of Refrigerating Engineers, aware of the seriousness of the vibration question, are studying all its aspects.

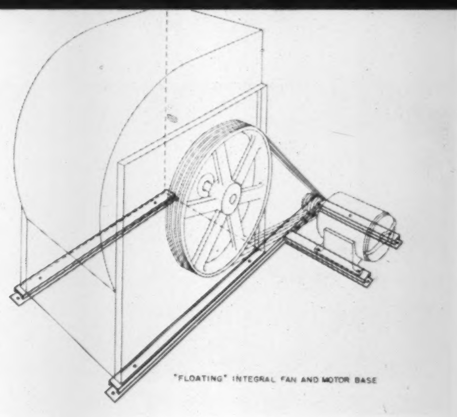
By far the worst offender is air conditioning. The experience of the chief engineer of a large New York office building is typical: "We have two air conditioning systems with different types of equipment. Both create vibrations in harmony and when they're in tune, brother, you have a racket! It's like the Fourth of July all over the building."

The sources of vibration within an air conditioning system are the reciprocating and rotating components in fans, motors, pumps, compressors, and other moving equipment. Since these components cannot remain perfectly balanced—due to eccentricities inherent in the machine design as well as normal wear—they set up a host of vibrations. These vibrations leave the equipment and race throughout the building by two main routes: (1) the general floor area; (2) piping and ductwork. The result may be heard (noise) or felt (vibration) or both. Whether heard or felt, it's a continuing source of annoyance.

Usually, these problems can be overcome by isolating the vibrating medium through the use of a resilient mounting such as cork, steel springs, rubber, felt, and the like. Selecting the proper method, however, depends on an understanding of vibration itself.



2 AIR CONDITIONING COMPRESSORS for NBC studios atop Empire State building are resiliently mounted as shown here. Refrigerant piping is of seamless flexible bronze tubing



3 FLOATING RAIL MOUNTING BASES make this fan and motor an integral unit with a single disturbing frequency

Explain Theory

A weight supported by a steel compression spring would be a simple vibration system. When loaded initially, the spring deflects a specific distance, which is known as the static deflection. If made to vibrate freely, this system would continue indefinitely with constant frequency—or number of cycles per minute—and amplitude. Ordinarily, however, damping influences—friction or hysteresis—dissipate the vibrational energy and gradually decrease the amplitude to zero. The frequency of the freely vibrating system is known as the natural frequency.

The formula for natural frequency of a simple linear vibration is:

$$f_n = 188/\sqrt{d} \quad \ldots\ldots\ldots\ldots\ldots\ldots [1]$$

where: f_n = the natural frequency of the mounted system in cycles per minute; 188 = constant, including the acceleration due to gravity; and d = deflection in inches.

The relationship between deflection and natural frequency of the simple linear vibration system is plotted in Fig. 6.

Any mechanism on resilient mountings has a natural frequency which can be determined by the chart if the static deflection of the mounting is known. Suppose, for example, that the mounting has a static deflection of 1 in. Pick out 1 in. on the vertical axis and follow its horizontal axis until it intersects with the diagonal line. From this point, drop down the line to the bottom and read the natural frequency; in this case 200 cpm. Manufacturers of vibration mountings, however, give the natural frequencies of their mounts within recommended load ranges.

Measure Forced Frequency

Vibrations are caused by external or periodic driving forces, such as the unbalanced moving parts in a reciprocating or rotary machine. The frequency of these vibrations is known as the forced or disturbing frequency, cycles per minute.

It is important to know this frequency in any mechanism to determine the proper type of mounting to be selected. Any unbalanced or reciprocating part forces the entire mechanism to vibrate at the same disturbing frequency. As a rule of thumb, use the rpm of the equipment as the disturbing frequency. However, when two motions per rotation are involved, the disturbing frequency can be obtained by doubling the rpm rate. In difficult or unusual cases, a reading from a vibration meter will give the frequency.

Isolate Vibration

Selecting the most suitable method of vibration isolation, both to and from equipment, depends on determining the "disturbing" or "forced" frequency of the equipment to be isolated. Here the "rpm thumb rule" is most often applied.

The natural frequency of the mounting must be well below the disturbing frequency if vibration transmission is to be reduced to an efficient degree. The mounting will then absorb the vibration instead of transmitting it. The greater the difference between the natural frequency and the disturbing frequency, the more effective the isolation. This is usually expressed in the form of a ratio:

$$F/f_n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [2]$$

where F = the disturbing frequency and f_n the natural frequency.

While this ratio is a good, workable rule, the vibration engineer takes it one step further to determine the degree of isolation the system will afford. He calls this measure of effectiveness "Transmissibility," and the formula is written this way:

$$T = 1/[1 - (F/f_n)^2] \quad \ldots\ldots\ldots [3]$$

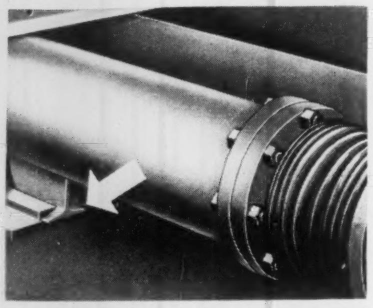
where T = transmissibility; F = disturbing or forced frequency; f_n = natural frequency of the mounted system.

For example, if a large compressor operates at 1000 rpm—F—and its natural frequency—f_n—after providing it with vibration mounts is 250, what is its "transmissibility" or effectiveness?

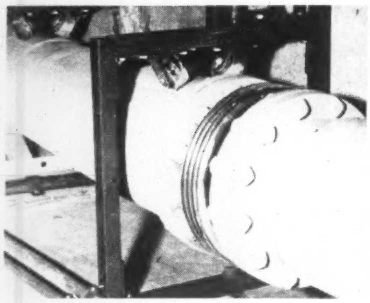
$$T = 1/[1 - (1/1000)/250] \quad \ldots\ldots [4]$$

To learn the percentage of vibration transmitted by this system, multiply T by 100 (0.066×100) or 6.6 percent. This means that the system is 93.33 percent effective.

The effects of varying ratios between natural and disturbing fre-



4 GUIDE WELDED TO PIPE and locked between angles allowing free axial movement of hot steam line to air conditioning turbine prevents possibility of offset



5 ANCHORS WITH ROLLER GUIDES absorb axial movement in this expansion joint connection. Flexible connection is a stainless steel, welded diaphragm type packless expansion joint

quencies on vibration absorption and transmission are shown in Fig. 7. For effective isolation, the ratio between the disturbing frequency and the natural frequency must always be greater than $\sqrt{2}$. Only for values above $\sqrt{2}$ is vibration absorbed; below that figure, vibration is amplified. Greatest amplification occurs at resonance when natural and forced frequencies coincide.

When the degree of vibration isolation must be exceptionally high, the frequency ratio should be 4 or more, which requires a large static deflection, as shown in Fig. 6. Satisfactory results, however, are usually obtained when the ratio is 2.5 or slightly higher.

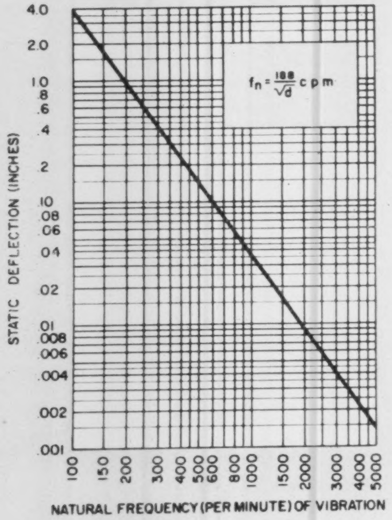
Solve Vibration Problems

Machinery rooms, cellars, roofs, and intermediate floors are the main trouble spots because pumps, compressors, and turbines send vibrations not only through the foundation and shell, but through the piping systems as well.

There are many types of isolators to reduce the vibrations from this machinery: steel springs, cork, felt, and rubber. One type of mounting consists of heavy formed steel channels that "float" in rubber which is securely bonded to steel angles. In this case, the angularity between steel parts is most carefully determined to load the rubber primarily in shear—for vibration absorption—and partly in compression to counteract shock and overload. This mounting has a deflection of ¼ in. at rated loads and a natural frequency of 370 cpm, which is recommended for a disturbing frequency of 750 cpm and above. Load ratings range from 40 to 4000 lb.

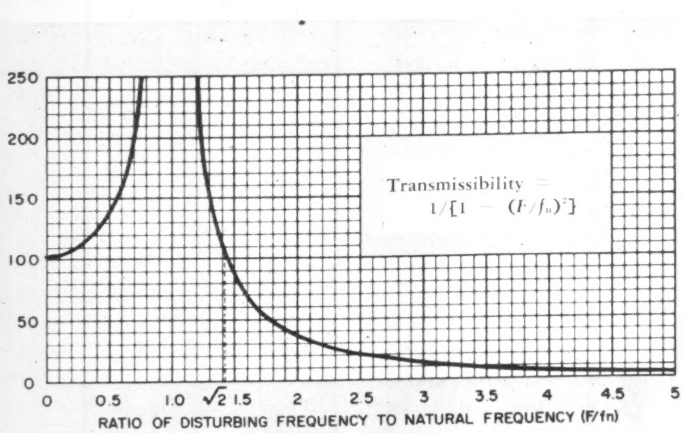
Use Flexible Pipe Connections

Isolating machinery from the foundation, however, is not enough. Water, refrigerants, steam, and other rigid pipe lines, for example, are excellent vibration conductors and must be isolated from pumps and compressors for complete vibration control. This is usually accomplished by installing flexible pipe connections between the fixed piping and the machinery. Three types are recommended according to the particular



6 STATIC DEFLECTION is shown here in relation to natural frequency. A freely vibrating system with constant frequency and amplitude would continue indefinitely if not for damping influences

7 TRANSMISSION AND ABSORPTION OF VIBRATION vary according to the ratio between natural and disturbing frequencies, as shown here



system involved, the amount of vibration reduction desired, and strength and cost factors.

Let's consider water lines first. Here, one popular flexible pipe connection is a wire reinforced, wrapped fabric section of rubber pipe. It has the ability to reduce noise transmissions, isolate vibration, and absorb water hammer. Moreover, its initial cost is low and installation is quite simple. It is capable of handling up to 250 psig, and ranges in standard sizes from ½ in. to 12 in. ID and up to 60 in. long. The flanges are the full faced forged steel type imbedded in and molded to rubber flanges. Metal-to-metal contacts are avoided and no gaskets are necessary. A typical installation is shown in Fig. 2.

Another effective method uses a specially designed seamless flexible bronze tubing built for liquid and gaseous refrigerant lines. This pipe is recommended because its flexibility permits transverse movements, which reduce thermal stresses in the piping system. It is made of 98.75 percent copper and 1.25 percent tin, and handles a wide range of pipe sizes from 3/16 in. to 8 in. ID. A protective cover of bronze wire braiding is welded to the copper ferrules and slip fittings.

A third flexible connection is most generally recommended for hot steam lines in air conditioning turbines and compressors. It is especially applicable where frequent cycling is encountered and absorption of vibration is necessary or desired. A stainless steel, welded diaphragm type packless expansion joint, it is capable of carrying the vacuum through 1000 psig pressure, and ranges in size from ½ in. to 72 in. ID. Used on straight line, anchor, or offset installations, it withstands temperatures from −300 F to +1800 F, and has the Van Stone lap, self-aligning pipe flanges or welded end fittings. Typical installations are shown in Figs. 4 and 5.

Isolating Fan and Motor Base

Due to an increased use of large fans and blowers in air conditioned buildings, good engineering practices today call for the effective control of noise and vibration from this equipment. This practice tends to eliminate disturbing transmissions, permits installations in critical locations, increases fan and motor speeds, and lengthens service life.

Vibration mountings most often used for this type of vibration control are made for equipment that has a common base, such as fans and fan motors. These units have natural frequencies of 370 cpm and are recommended for disturbing frequencies above 750 cpm and above. (Disturbing frequencies of virtually all fan units are well above 750 cpm.)

They consist of heavy structural steel channels bolted over a rubber-in-shear isolator welded to a steel baseplate. The channel distributes the weight evenly over the isolators. These isolators are carefully selected according to the length and hardness of the rubber to obtain accurate loading and load distribution. Motor supporting channels on fan and motor bases are welded to the channel supporting the drive side of the fan. Thus, the fan and its motor are integral, with one natural frequency.

The mountings and bases are custom built in accordance with the weight distribution, center of gravity, operating speed, and distance between mounting and lag hole centers. A typical application is sketched in Fig. 3. Due to the rubber-in-shear isolator, these units have a low acoustical impedance which reduces the transmission of high frequency sound waves.

Take Out Pipe Line "Knock"

Two types of vibration hangers—rubber-in-shear and steel spring—are most often specified to control noise and vibration in overhead piping subject to thermal expansion and contraction or water hammer. These hangers are also used to prevent noise and vibration transmissions from suspended air conditioning units, fans, and blowers.

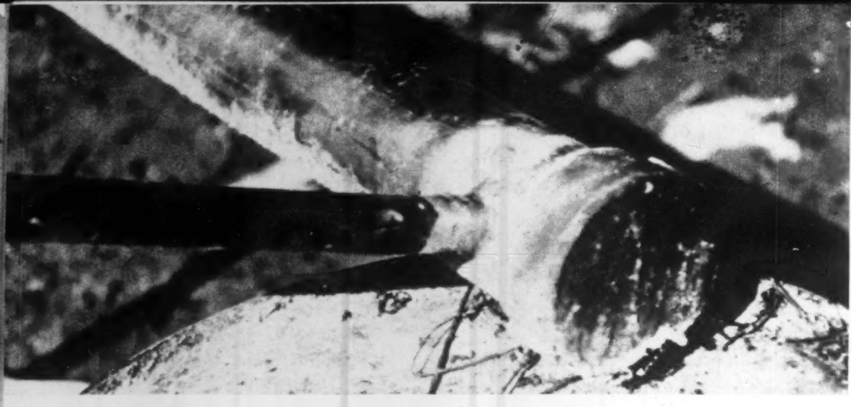
The rubber-in-shear type has a natural frequency of 370 cpm and is used for disturbing frequencies of 750 cpm. It is made of a durable bonded rubber-in-shear isolator spot welded inside a steel housing. The housing acts as a safety feature by preventing the suspended equipment from falling in the event of rubber damage. The load is transferred by means of rods or bolts with washers that rest on the isolating medium. This unit provides high deflection with good isolation characteristics.

The inherent damping of rubber suppresses excessive motion when the equipment operates near or passes through resonance. The low acoustical impedance of rubber also reduces high frequency sound wave transmissions. Load ranges handled vary from 30 to 1500 lb and higher by this type of absorber.

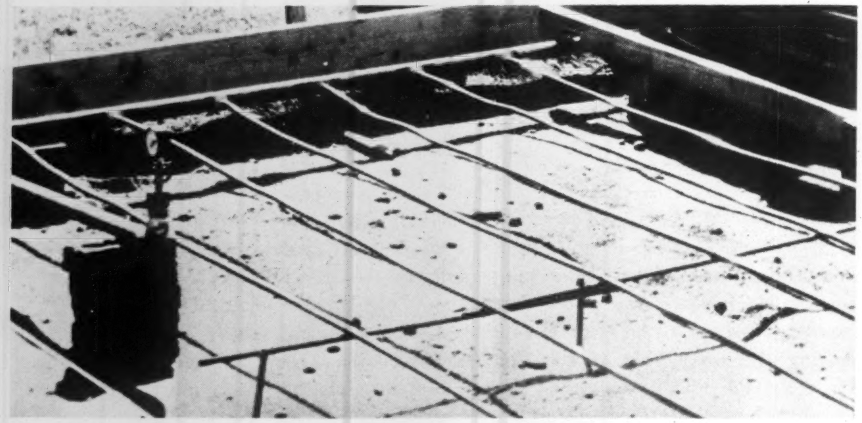
How To Double Deflection

It is also possible with this type of vibration hanger to incorporate two isolators in series which will give double the deflection. As a result, the units have a lower natural frequency and a correspondingly higher degree of isolation. They are particularly used for isolating low frequency disturbances.

A steel spring type of vibration hanger is most often specified when service conditions are more severe; that is, where large deflections are required due to thermal expansion; where high and low temperatures are involved; and where very low disturbing frequencies are encountered. They are also used in a corrosive atmosphere and with extreme temperature fluctuations. These units consist of a helical steel spring enclosed in a steel housing. Springs are made of oil tempered, carbon steel wire. They withstand corrosion, high temperature without creep or permanent set, and low temperature without increase in stiffness. With the steel spring, as with rubber-in-shear, the load is transferred to the isolating material by means of rods or bolts with washers that rest on the bearing plates. In this one, however, the top plate has a rubber isolation washer to minimize noise transmissions, and a rubber damper washer to limit excursion at resonance. ╪



How to Install Snow Melters



Using Copper Water Tube

Here are time saving techniques made possible by special properties which simplify installation problems

BY N. W. SMITH
Research Dept.
Revere Copper & Brass, Inc.

In the planning and installation of snow melting systems, designers and contractors alike are constantly adopting techniques which will simplify problems of fabrication and thereby economize on the cost of installation. The subject of techniques includes not only use of detail but also judicious choice of piping materials and utilization of their physical characteristics.

The properties of copper include: small outside diameter of the tube in relation to inside diameter, the ability to make strong, enduring joints by both silver alloy brazing and lead-tin soldering, bendability of the tube, long lengths of tube when used in coil form, and low frictional resistance to fluid flow.

Choose Grid or Sinuous Type

Coil design for snow melting systems of copper water tube generally falls within either or both of the following categories: the grid type coil and the sinuous or serpentine type. The choice of type is governed by specific design conditions and, therefore, is a matter of judgment on the part of the designing engineer.

In the grid type of coil the fluid is supplied to the coil through a supply header, follows parallel paths through the coil, equal in number to the rows of tube, to the return header, whence it is returned to the heat source. Such a coil possesses the advantage of offering low hydraulic resistance to flow, but possesses the disadvantage of requiring many joints between the rows of tube and the headers.

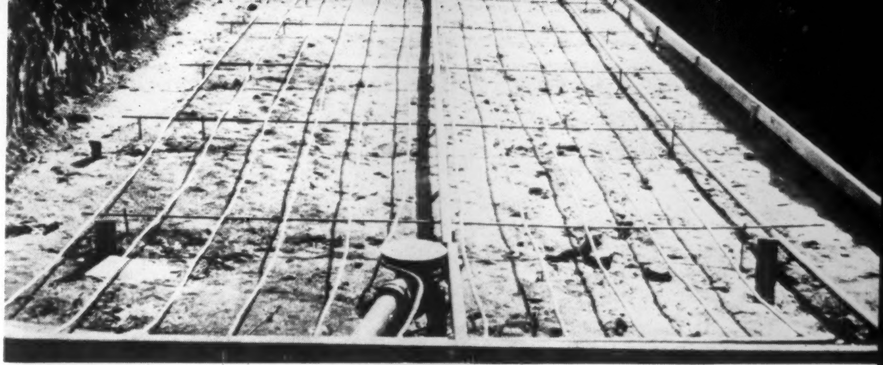
In the sinuous coil one continuous length of tube bent to form parallel rows conveys all of the heating fluid from the point of supply to the point of return to the system from the area being served. If long lengths of soft temper tube are used, bends may be made and few joints will be required, but a definite limitation on the length of coil is imposed by its hydraulic resistance.

Weld Headers Economically

If the designer has chosen the grid type coil, he is immediately faced with the problem of economical fabrication of the headers.

A header arrangement that has been found very satisfactory when nonferrous piping is used is shown in the photos on this page. Extra heavy red brass pipe was used for the headers, and holes were drilled through the pipe wall at a tube spacing of 12 in. on centers with a diameter of 0.003 in. greater than the outside diameter of the tubes in the coil.

After the tube ends had been cut square, cleaned, and fluxed, marks were placed 1/4 in. from the ends of the tubes and the tubes inserted to that depth into the holes and silver brazed. Once the initial heating for the first joint had been accomplished, the conducted heat along the header made the application of heat for the brazing operation at the next joint



3 TUBE SUPPORT METHOD shown here consists of wiring tube at required spacing — in this case 12 in. on centers — to ½ in. horizontal steel reinforcing rods, which are wired to short vertical rods to give tubes desired depth in slab

correspondingly shorter. The small clearance between the exterior of the tube and the hole in the header wall was responsible for silver brazed joints of maximum strength made with a minimum of silver brazing alloy.

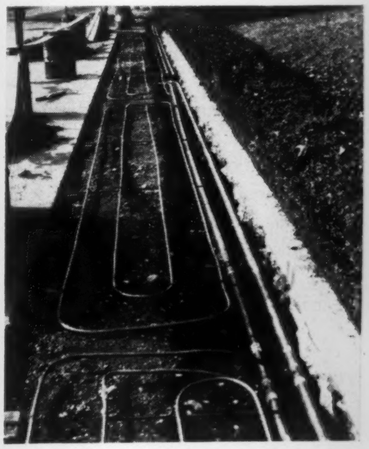
It should be especially noted that the smooth exterior finish of the copper tube coupled with its relatively small outside diameter in relation to its nominal size made it feasible to insert the tube and silver braze it as described.

Bury Tube About 2 In. in Slab

The most common snow melting systems are used in concrete slabs in the form of sidewalks, ramps, driveways, and so on. It is not uncommon for them to be used where blacktop is the embedding medium. For efficient heat transfer upward to the top surface of the slab in any snow melting system the tube should be embedded to a distance of about 2 in. from the top of the tube to the top of the slab.

An effective and easy method of support for the tube is shown in Fig. 3. The tube is wired at the required tube spacing, in this case 12 in. on centers, to ½ in. horizontal steel reinforcing rods, which in turn are wired to short vertical rods to give support at the desired distance above the base of the slab. By spacing the horizontal supporting rods every 6 ft it is possible to use soft temper tube without sagging between the lines of support. The use of soft temper copper water tube, coming as it does in 60 ft coils, generally will eliminate the necessity for many joints in the run of the tube between the headers.

4 WOOD DISC helps make smooth bends with soft temper tube on a given radius



5 SINUOUS COIL of this sidewalk snow melter extends 25 ft between expansion joints

Coils, Loops Give Expansion

Many designers and contractors prefer to avoid passing tubes through expansion joints in a slab due to the stresses that might, under certain conditions, be concentrated at those locations resulting from movement of the slab.

In the case of sidewalks or some driveways, the areas that lie between expansion joints may be of such a size as to make the use of a sinuous coil more practical than the grid type. One continuous length of tube, looped back and forth in parallel rows across the area, eliminates the numerous joints required in the headers of a grid coil and requires only the two connections to the supply and return mains.

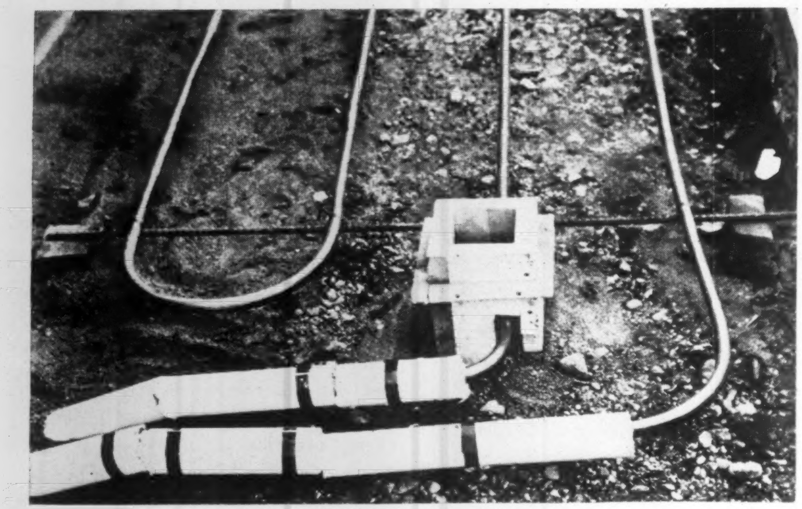
Wood Discs Aid Bending

To assist in making smooth bends with soft temper tube on a given radius, wood discs similar to that shown in Fig. 4 can be nailed to a floor or suitable bench and the tube bent in 180 deg return bends around them. Location of the discs at the proper distance between return bends with guide strips between permits the tube to be unrolled back and forth in straight lines between the bends into a sinuous pattern having the required center to center tube spacing between the rows and the specified distance over return bends.

Experience has shown that for successful bending of soft temper copper tube certain minimum diameters of wooden discs must be observed for each size and type of tube. For the guidance of designers and contractors, the following table is given:

Nominal size, in.	Type of tube (soft temper)	Minimum disc diameter, in.	Tube spacing between rows, c-c, in
½	K or L	8⅜	9
¾	K	8⅛	9
¾	L	11⅛	12
1	K or L	16⅞	18

The bending of soft temper copper water tube by the above method



6 BALANCING VALVE gets access space by means of wood form before concrete is poured. Valves were installed on each of 10 coils on this job

in sizes above 1 in. is not recommended.

A sidewalk snow melting job in which the bendability of copper water tube has been put to good use is shown in Fig. 5. It was necessary to confine the individual coils to areas of sidewalk extending 25 ft between expansion joints. The coils were formed of ¾ in. soft temper tube with four rows spaced 12 in. c-c and 23 ft, 6 in. over return bends.

Only one coupling was required in this length of tube and only two joints for connections to the supply and return mains. Since this expanse of sidewalk was 247 ft long, the supply and return mains were run underneath one side of the slab. They were not embedded in the concrete but were supported and covered by sand to permit movement caused by expansion and contraction. A closeup of the takeoffs from the mains to the coils is shown in Fig. 6. These takeoffs were wrapped with insulation for a distance of 2 or 3 ft to allow for the movement that would be communicated to them by the mains.

Keep Rates of Flow in Balance

It is essential, in order to maintain uniform melting conditions over the entire area, that rates of flow through the various parts of the system be kept in hydraulic balance. This may be accomplished through the use of coils of uniform length and the provision of a reverse return main to the heat source. If this is not feasible, the use of balancing valves on the individual coils will permit any desired reduction in flow through the paths of least resistance, thus keeping flow rates in balance throughout the system.

In the sidewalk installation illustrated in Figs. 5 and 6, balancing valves were installed on each of the 10 coils, and no reverse return main was provided. The wood box shown in Fig. 6 is a form built around the balancing valve so as to provide an access space for each valve after the concrete has been poured. A small metal plate set flush with the surface walk will serve as a cover for the access box.

A somewhat similar snow melting system was designed for a long driveway. Specifications required that the concrete slab for this driveway, which was to serve a milk processing plant, should be provided with transverse expansion joints every 30 ft.

Again, to avoid running any of the tube through an expansion joint, it was decided to run the main underneath one side of the slab, with takeoffs to the separate rectangular panel areas lying between the joints. Hydraulic limitations dictated that individual coil lengths should not exceed 130 ft, therefore, each panel area was served by three sinuous coils fed by supply and return headers embedded in the slab. These headers were connected to the mains underneath the slab by soft temper copper water tube encased in insulation to provide room for movement communicated to them by possible longitudinal movement of the mains caused by expansion and contraction.

Thus, the physical properties of copper water tube are put to good use in simplifying some of the problems of installation. #

Air Conditioning Helps Heart Cases Live Longer

. . . says leading cardiologist

AN AIR CONDITIONING executive has cited the endorsement of air conditioning for heart patients and aged people by a leading international authority on cardiology as "of vital significance to the industry."

Mark E. Mooney, vice president in charge of sales for the Typhoon Air Conditioning Co., Div. of Hupp Corp., referred to an article by Dr. George E. Burch, professor of medicine at Tulane university school of medicine. Dr Burch wrote:

"There is a definite need to consider the hot and humid environment produced by climate, industrial working conditions, or overcrowding of the sickroom in the treatment of all patients in whom it is desired to reduce cardiac work (i.e., cut down excessive heart activity.) Greater use of air conditioning in hospitals, cardiac wards, offices, and homes will assist toward this end."

Mr. Mooney commented that while the public has, in the past decade, given comfort cooling wide acceptance, the health giving and life saving qualities of air conditioning have been generally ignored by the industry. #

The Law and Your Profits

BY WILLIAM HURD HILLYER

Customs Are No Support in Court

. . . piping contractor finds when he loses suit against general contractor who had used his bid figures in obtaining the general contract and then awarded the piping subcontract to another firm

It is unsafe for a heating, piping, and air conditioning contractor to rely upon custom and usages for receiving a subcontract covering items on which he has supplied figures to the general contractor.

The U. S. government advertised for bids on the construction of four buildings.

Days before the bid opening date, Mechanick Bros. submitted their bid for the piping subcontract to Industro, Inc., the general contractor, expecting no reimbursement for the actual costs ($210) of preparing it, except as they might be compensated by receiving the subcontract.

Industro used Mechanick's figures on the prime contract. In court action which followed later, a witness for Industro testified that the piping firm's figures had been so used under the mistaken impression that Mechanick's bid was the lowest submitted up to bid-opening time.

However, it transpired from an abstract of the bids submitted to the government that the bids of six prime contractors on the piping system were lower than Industro's bid based on Mechanick's figures. "Hence it would appear," reasoned the court that since Industro "was awarded the prime contract with a low bid of $224.929" that his bid "on items other than the piping was the controlling factor."

The general contractor, Industro, refused to give the subcontract on the piping to Mechanick Bros. Instead, when Industro was awarded the prime contract with a low bid of $224.929, it in turn awarded the entire piping subcontract to John Doe, Inc., for $63.803.

Mechanick sued Industro in superior court. He stated in his brief that the general contracting corporation, by using his bid figures on a portion of the work to be performed, was obligated to award the subcontract to Mechanick at his bid figure, rather than to another bidder whose bid may have been lower. Mechanick had won a judgment for $4154 in the trial court, as a "reasonable profit" that would have been made had the subcontract been awarded them.

Two theories were put forward by the trial court:

1) The use of estimates furnished by a subcontractor to a prime contractor, who thereafter gets the entire job, gives rise to an implied contract between prime contractor and subcontractor.

2) There is, and there was at the time referred to, a prevailing custom in the subject industry for general contractors to solicit bids before opening date from subcontractors in specialized fields (such as piping).

These bids, the court declared, serve not only as a valuable aid to general contractors in preparing their own bids, but as an offer to perform the work for the bid price. Furthermore, the court asserted, if the figures are used by the general contractor in compiling his bid and he be awarded the general contract by the government, then by acceptance and use of the figures compiled by subcontract bidder on the various items included therein, there was created an implied obligation to enter into a subcontract with the firm whose bid the general contractor accepted and used.

Unfortunately for the piping subcontractor, the supreme court took a different view: Before there can be an implied contract there must be an offer, an acceptance in terms of the offer and communication to the offeror. In addition there must be a mutual intention to contract.

Did the Industro Corp.'s use of Mechanick's offer in its bid upon the prime contract, constitute an acceptance thereof, conditioned only on the prime contract being awarded to that company?

"We think not," said the supreme court, which reasoned:

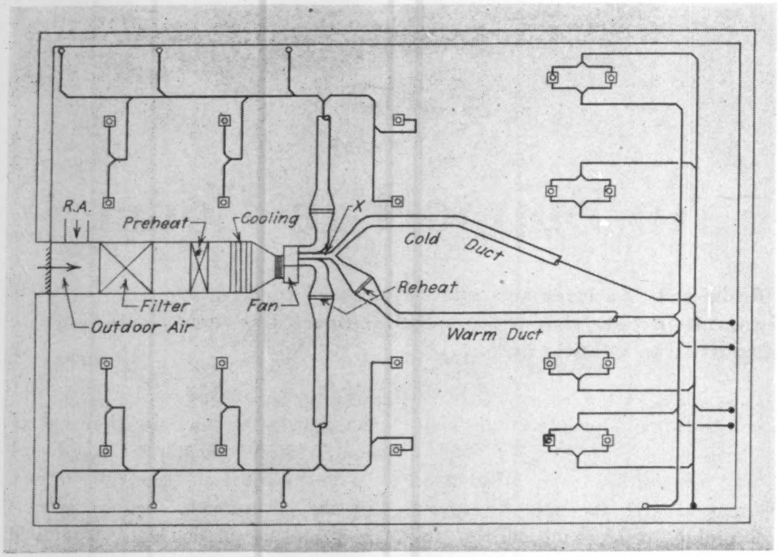
a) Mechanick did not expect to be reimbursed for the actual cost of preparing their bid, except as they might be compensated by receiving a subcontract.

b) As the bids of the six prime contractors on the piping installation were lower than Industro's bid for those items based on Mechanick's figures, "we conclude that the record will not support recovery . . . "

The mere use of Mechanick's figures did not constitute an acceptance of their offer. "Hence, there is no contract between the parties." The judgment was reversed, with instructions to dismiss Mechanick's suit. ‡

WILLIAM HURD HILLYER, *author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. He has an extensive practical legal and financial background.*

This series presents actual cases. Naturally, laws vary in different states. All names are fictitious.



5 DUCT LAYOUT for a two-story office building included a dual duct zone and two single duct zones, all supplied by the same fan. Excessive noise in the offices served by the dual duct system was eliminated by installing an automatic damper at Point X to regulate the volume

How to Balance High Velocity Air Conditioning Systems

System inspection and the use of proper balancing procedures can save time and avoid snags in operating the system. The author outlined a step by step procedure based upon experience in the March HPAC. He tells here how operating snags were corrected in three recent installations.

BY WILLIAM J. WAELDNER
Anemostat Corp. of America

THE DIFFICULTIES in operating high velocity systems after they are installed result frequently from inadequate knowledge of the engineering principles involved in designing the system or from a misunderstanding of the engineering design. A few actual installations will indicate the type of "bug" that can develop.

Fan Serves Two Systems

In a completely air conditioned two story office building, the partial duct layout shown in Fig. 5 was installed. The building is divided into three zones: east and west single duct zones and a south dual duct zone. In addition, perimeter radiation existed to take care of the winter heating cycle. This is a novel arrangement in that a single fan supplies air to both single and dual duct systems. The dual duct zone supplies air to the executive offices, library, and board room.

The contractor attempted to balance the system with the result that the sound level and air volume in the executive offices was well above the acceptable level. When the system was thoroughly analyzed, the following difficulties were found to exist:

1) There was no adjustable fan speed control or other volume control on the entire supply duct system.

2) No provision was made in the dual duct part of the system to control either the duct static pressure or total air volume.

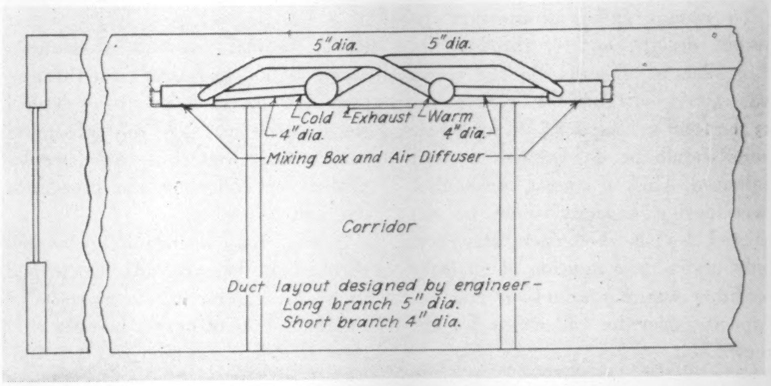
3) Under normal operating conditions the static pressure at the high velocity dual duct units supplying air to the executive quarters, midway down the system, was as high as $3\frac{1}{2}$ in. WG, whereas the units were balanced on the basis of $1\frac{3}{4}$ in. WG duct static pressure.

To reduce the noise level in the executive offices it was necessary to control the duct pressure at approximately the value at which the units were balanced, without appreciably changing the pressure available for the single duct zones.

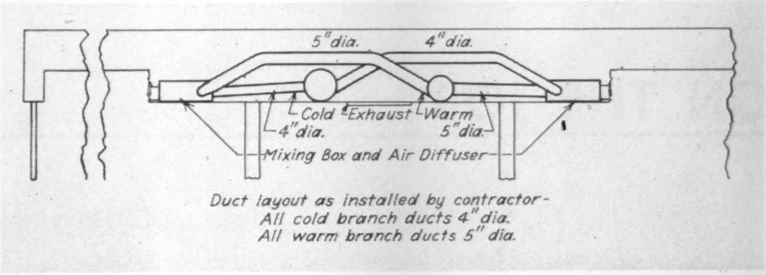
In this instance an inlet vane

damper or a change in the fan drive was not desirable because either would alter the complete system pressure rather than just the dual duct system. Fortunately, the dual duct system started as a single duct from the fan plenum. The installation of an automatic volume damper in the duct, before the split to hot and cold at the Point X proved to be practical. The total volume through the dual duct system was sensed some length ahead of this damper. With the total volume controlled in this manner, the static pressure at the dual duct midposition was also regulated at a constant value, thus the cause of excessive air volume had been corrected.

Field service was required on this job principally because of the omission of a volume or other control in the original system design. The dual duct system was designed with provision for 100 percent capacity through either hot or cold duct, without providing some means to compensate for the duct friction change as the flow varied between the hot and cold ducts.



6 HOT AND COLD DUCT RUNOUTS for a high inside wall system in a two-story building are shown as designed by the engineer. However, balancing attempts revealed that units on one side of the building would handle only 90 percent of design volume on the "cold" duct while handling 110 percent on the "hot" duct


5" dia.
4" dia.
Cold
Exhaust
Warm
4" dia.
5" dia.
Mixing Box and Air Diffuser
Duct layout as installed by contractor -
All cold branch ducts 4" dia.
All warm branch ducts 5" dia.

7 INCORRECT INSTALLATION of runout ducts to diffusers — both long branches should have been 5 in. diam and both short branches should have been 4 in. diam — compensated for by increasing the fan speed to provide design capacity through the cold inlets of all diffuser units

Dual Duct Sizes Reversed

Another installation that caused some trouble in balancing — a dual duct system — was in a two-story office building with a typical section shown in Fig. 6. The basic floor plans for the first and second stories are identical. Equipment is in the basement. The building is two bays wide, with a central corridor down each floor. High inside wall straightline units were installed, and double glazing was used to eliminate the cold downdraft during the winter.

After the system had been completed and balancing attempted, the consulting engineer reported that the units on one side of the building would handle only 90 percent of the design volume on the "cold" duct, while handling 110 percent on the hot duct.

A check of the duct design drawings indicated that the hot ducts had a slightly higher resistance, and therefore a greater volume of cold air should have flowed through any unit for similar conditions. Verification of the actual volume of air through the particular straightline units indicated that the engineer's report was correct. When we checked the respective capacities of the hot and cold ducts, it was necessary to adjust the thermostats so that all valves were open hot while checking the flow through the hot deck, and open cold to check the flow through the cold deck.

Fortunately, the attic space was accessible from the second floor exhaust grilles. Inspection of the actual ductwork and comparison with the design drawings showed that a switch of serious magnitude had been made in the installation, as shown in Fig. 7. The engineer had intended the long runouts — or crossover branches — to be 5 in. diameter flexible duct and the short lengths to be 4 in. in diameter. Instead of arranging the ductwork as shown on the drawings, however, the sheet metal contractor used the 4 in. diameter duct for the cold branch ducts and the 5 in. diameter flexible duct for the hot branch ducts.

This inspection and previous study of the design drawings clearly pointed up the cause for the unusual flow in half of the building. A further aggravation to this condition was found in the flexible branch ducts to the units. The flexible tubes were bent around a short, tight radius which increased the resistance sharply by decreasing the inside diameter of the tubing. For example, if the flexible material collapses inside the tubing to a height of only $\frac{3}{8}$ in. on the 4 in. diameter duct, the velocity is increased one and a half times. In other words, the velocity pressure for a given capacity is double that for the full 4 in. diameter duct.

To obtain sufficient pressure to permit design capacity through the cold inlets of all units, the fan speed was increased and the system re- as the total fan capacity. In addition, units should be determined, as well balanced. This, of course, meant that over design capacity could be delivered by the hot duct. However, only under the condition of an early morning warmup would the full hot capacity ever be called for by the thermostat.

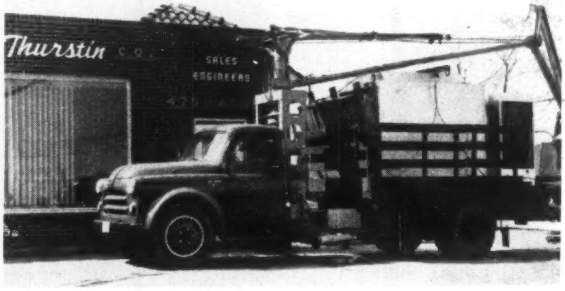
Matter in Duct Cuts Cold Air

A third installation that hit operating snags is one of the largest dual duct high velocity systems to be installed. It serves the entire two floors of a building of over 1,280,000 sq ft. A typical fan system handles about 40,000 to 60,000 cfm through over 100 units. Balancing a typical fan system on this job presented some difficulties but was accomplished by following the procedure outlined above.

When the operating personnel checked the balance capacities turned in by the contractor, the two sets of numbers did not agree. Investigation showed that the system was originally balanced with all the air through the cold duct. However, when the operating personnel checked the capacities, the system was operating under control of the room thermostats, which caused the supply air to flow through both ducts, thereby changing the duct static pressures which resulted in the changed capacities as reported. These changes were in the order of 10 to 15 percent total unit capacity.

Another incident on this job involved a case of too much hot air and too little cold air from a particular unit that was on a run between two other units which balanced perfectly to the required capacity. The valve movement was checked through the diffuser neck, the pneumatic control pressure and operation of adjacent units was examined, and all was found to be in order. Finally, inspection of the supply duct showed that a piece of insulation had lodged in the duct and prevented normal flow to the unit. ≠

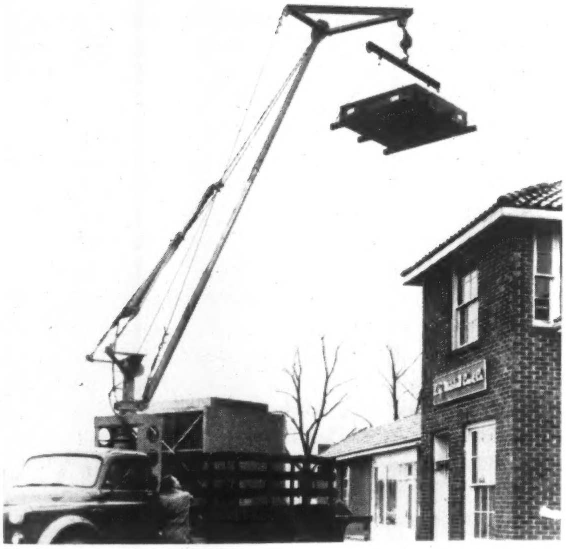
ON THE JOB



Truck Crane Speeds Cooling Tower Installation

THE AIR CONDITIONING sales engineering firm of Hank Thurstin Co., Denver, found cooling tower sales skyrocketing when the city restricted the use of water for air conditioning. To provide the fast installation service demanded, and at low labor cost, the firm purchased a mobile crane. When not in use, the truck crane is rented to noncompetitive businesses. Hydraulically operated, it will lift loads up to 5000 lb in a single lift. The telescopic boom works within a 280 deg arc and can deposit a unit on a roof or ease it into a second story window. The boom swings into a horizontal position for traveling. ≠

Photos courtesy Dodge Truck



Addresses of Engineering Societies, Associations

Acoustical Society of America, 57 E. 55th St., New York 22, N. Y.
Air Conditioning Blower Manufacturers Association, 2300 Payne Ave., Cleveland 14, Ohio
Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C.
Air-Conditioning and Refrigeration Wholesalers, 2607 N. High St., Columbus, Ohio
Air Cooling Institute, P.O. Box 2121, Wichita Falls, Texas
Air Distribution Institute, 2130 Keith Bldg., Cleveland 15, Ohio
Air Filter Institute, 300 Independence Ave., S.E., Washington 3, D. C.
Air Moving and Conditioning Association, Inc. 2159 Guardian Bldg., Detroit 26, Mich.
Air Pollution Control Association, 4400 Fifth Ave., Pittsburgh 13, Pa.
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Heating, Piping & Air Conditioning

Journal Section

of the

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

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SOCIETY COMMITTEE ORGANIZATION

General Committees: The By-Laws provide for 9 such committees. The listing appears in this issue on page 174

Research Committees: The research program is under the guidance of the Committee on Research — a General Committee. The Committee on Research appoints Technical Advisory Committees as needed. Latest list, with current membership, appeared in January 1957 issue 218-19

Special Committees: At present there are 9 of these committees. The list of them and of their personnel can be found in this issue on page 174

Nominating Committee: This committee's membership is fixed by the By-Laws. The listing appears in this issue on page 174

SOCIETY REGIONAL ORGANIZATION

The latest listing of the names of the Regional Directors and of the members of the Chapters Regional Committees appears in the April 1957 issue on page 176

SOCIETY CHAPTERS AND BRANCHES

The Society has chartered 67 Chapters, 1 Special Branch, and 6 Student Branches. These groups elect their officers and governing boards. A list of the presidents and secretaries appears in the February JOURNAL on pages .. 267-68

The President's Page

Technical Manpower

IN recent months I attended the several Chapters Regional Committee meetings. These meetings have proved stimulating and informative. They also gave me the opportunity to talk on the subject *Our Bottleneck — Technical Knowhow,* which concerns the problem of how to bring more graduate engineers and engineering technicians into our field.

Many forces have disturbed the traditional balance between technical manpower *requirements,* for replacement and normal expansion, and the traditional *sources* that heretofore supplied these requirements. The present gap between requirement and supply is wide enough to affect adversely certain areas of HVAC activities, particularly those areas that design (consulting engineers) and coordinate installations (mechanical contractors). More qualified and experienced men are required, and many more will be required, to handle the greatly increased volume of work. To compound this discrepancy due to increased volume, HVAC work is also becoming increasingly complex due to new techniques. And to further complicate matters, this need for more technical men comes when the source of supply has been constantly shrinking because of the increasing demands of modern technology in our modern life.

Before World War II, the more important traditional sources of technical manpower were:

The engineering college that offered a mechanical engineering specialty or option course in HVAC.
The engineering college that graduated mechanical engineers.
The two or three-year certificate course that led to a sub-professional certificate in HVAC, and
Draftsmen trained by a long-term apprenticeship in drafting rooms of consulting engineers and mechanical contractors.

Lately this picture has changed. Since World War II, there has been a drying up of some of these sources. The degree-option course has largely been dropped in line with today's tendency to drop all specializing courses. The typical engineering college curriculum now includes mathematics, science and humanities, in addition to the usual basic engineering sciences and, therefore, permits less time for specializing courses.

We will always have the mechanical engineering group as a source of manpower. Our industry needs — while requiring greater numbers from this source — must now meet the competition of the other and some newer industries that require the same men. Modern peacetime and defense technology has been absorbing a larger number of scientists, engineers and technicians. We must effectively compete with these newer technological industries such as aeronautics, jet engines, electronics and nucleonics for our share of the most competent graduates.

What can we, as a Society, be doing in this regard? Important is steady and forceful *publicity.* We must publicize the situation that exists and point to our need for more skilled people with a good technical background. We must emphasize that a shortage in this area can affect the orderly expansion of our HVAC work. We must tell about the advantages of working in our field. We should improve relations between local chapters and their nearby mechanical engineering professors because, through their good will, many good men could be directed to us. We should invite undergraduates from nearby schools to attend local chapter meetings. All these steps would fit into the general category of *publicity.* Our Long-Range Planning Committee and our Public Relations Committee have both been aware of these possibilities and are working in this direction.

Another useful forward step would be to activate a local education committee for each chapter to work with nearby colleges and technical institutes in setting up more two- or three-year training programs that will develop *engineering technicians* qualified to work in our drafting rooms. Other engineering fields now recognize that merely more graduate engineers is not the total answer to the general shortage in technical manpower, and are using more *engineering technicians* to bolster the total engineering team. The chapter education committee could also assist by arranging for teaching assistance from industry. We need a program that will plan for and increase the output of these technical institutes that are giving or could give accredited courses in our field.

Of necessity I have here only briefly highlighted the problem and suggested several corrective steps that we should consider to alleviate the condition. The Long-Range Planning Committee has been asked to study our overall technical manpower situation, with the objective of formulating a working plan for Council consideration. While the immediate problem is of some concern, it is the longer range viewpoint that is important.

ASHAE — the technical society for HVAC work — should be alert and should plan to accommodate to the changing working conditions and the changing practices within the overall engineering educational system.

P. B. Gordon
President
American Society of Heating and Air-Conditioning Engineers

Velocities and Temperatures on Axis of Downward Heated Jet from 4-Inch Long-Radius ASME Nozzle

By Rudiger Knaak*, Manhattan, Kans.

This paper is the result of research sponsored by the American Society of Heating and Air-Conditioning Engineers, in cooperation with the Engineering Experiment Station of Kansas State College, Manhattan, Kan.

SUMMARY — Reports a research project to obtain and correlate data on the centerline velocity and centerline temperature elevation of air projected downwardly through a 4-in. *ASME* nozzle. Equations are presented, by the use of which correlations of both these quantities may be obtained. It was found that in spite of precautions to insure steady centerline velocities, these velocities varied, and due to this condition, no procedure was developed for making certain the measurement of true centerline values. Temperature fluctuations were found to influence the accuracy of the measurements to a much smaller degree than did velocity fluctuations.

THE research reported in this paper was pursued at Kansas State College under the guidance of Linn Helander and the Technical Advisory Committee on Air Distribution.† The research was limited in scope. In the first place, it dealt solely with a downwardly projected, heated jet formed by a 4-in. long-radius *ASME* nozzle. In the second place, its specific objective was to obtain and correlate data on the centerline velocity, U_c, and the centerline temperature elevation, $T_c - T_a$.

Measured valves of U_c and $T_c - T_a$ were correlated with the travel of the jet by means of 2 curve-matching equations, one for the centerline velocities, the other for the centerline temperatures (Equations 4 and 11). The equation used for the centerline velocity, U_c, involved 4 interrelated empirical factors: (1) h_o, which located the apparent point source of the jet; (2) L_p and (3) $L_{max,\,n}$ which located the points of travel at which U_c from the equation had, respectively, the outlet value, U_{oc}, and a value of zero; and (4) an exponent, n. By a process of trial and error, combinations of these factors consistent with the experimental data were established for values of n between 1/3 and unity. Each value of n was associated with a unique value of $L_{max,\,n}$. The best correlation of the data was obtained by setting n equal to ½. In this case, $L_{max,\,n}/D_o$ had a value of $(2B_{oc})^{1/2}$. (D_o = outlet diameter, B_{oc} = outlet buoyancy number, see Nomenclature.) When n was set equal to unity, $L_{max,\,n}/D_o$ had the value of L_{max}/D_o previously reported[2], namely, $1.66(B_{oc})^{1/2}$. Good correlation of U_c with travel was obtained with all values of n from 1/3 to unity, when n was coupled with the corresponding best correlating value of $L_{max,\,n}$.

Table 1 — Empirical Equations which Correlate Test Data Presented Herein on Downward Jets of Heated Air from a 4-in. Long-Radius *ASME* Nozzle[a]

Equations for Isothermal Jet:

For $L/D_o \geq 8$, $U_c/U_{oc} = 6.4\ L/D_o$

For $3 < L/D_o < 8$, $U_c/U_{oc} = -0.008\ (L/D_o)^2 + 0.048\ (L/D_o) + 0.928$

Equations for Heated Jet: n = ½

$$L_{max,\,n}/D_o = \sqrt{2B_{oc}}$$

For Primary Zone, $U_c/U_{oc} = [1 - 2g\ [(T_c - T_a)/T_a]\ [L/U_{oc}^2]]^{1/2}$

For Principal Zone, $U_c/U_{oc} = (bh_p/h)\ [1 - [h/h_{max,\,n}]^2]^{1/2}$

$b = 1/[1 - [h_p/h_{max,\,n}]^2]^{1/2}$

$h_p/h_{max,\,n} = 84/(B_{oc} + 138) + 0.06$

$L_p/D_o = [172/[1 + 172/(\sqrt{2B_{oc}} + 7.5)^2]]^{1/2} - 7.5$

$(T_c - T_a)/(T_{oc} - T_a) = h'_p/h' = (L'_p + h'_o)/(L + h'_o)$

$L'_p/D_o = 1.48\ B_{oc}^{0.14}$

$h'_o/D_o = 4400/(B_{oc} + 820) - 0.51$

[a] See Nomenclature and Glossary of Terms for definitions.

Nomenclature

b = a dimensionless empirical factor = $1/[1 - (h_p/h_{max,\,n})^2]^n$

B = buoyancy number = $(U^2/gD_o)/(T/T_a - 1)$.

c = subscript, denoting values at center of jet, *i.e.*, along vertical axis of jet defined as locus of maximum local velocities.

D_o = Outlet diameter, feet.

g = acceleration due to gravity, feet per (second) (second).

h = vertical coordinate for locating velocities, feet.

h_p = value of h where U_c/U_{oc} from Equation 5 has a value of unity, feet.

h' = vertical coordinate for locating temperatures, feet.

h'_p = value of h' where $(T_c - T_a)/(T_{oc} - T_a)$ from Equation 11 is unity, feet.

L = distance from outlet, feet.

L'_p = value of L where $(T_c - T_a)/(T_{oc} - T_a)$ from Equation 11 is unity, feet.

m = $h_p/h_{max,\,n}$.

$_{max}$ = subscript, denoting value at observed end of jet, determined by moving both a Pitot tube and thermocouple into the jet from floor level and noting point at which both gave distinct evidence of entering the jet.

$_{max,\,n}$ = subscript denoting value where U from Equations 4 or 5 has a value of zero.

$_{max,\,n=\frac{1}{2}}$ = same as $_{max,\,n}$ for case wherein n = ½.

n = exponent in Equations 4, 5, and 6, determined experimentally.

$_n$ = used as a subscript, see $_{max,\,n}$.

$_o$ = subscript, denoting value at outlet.

T = temperature, degrees Rankine.

T_a = room Temperature, 30 in. above floor at point remote from jet, degrees Rankine.

t = temperature, degrees Fahrenheit.

U = downward velocity, feet per second.

X = $(h - h_p)/(h_{max,\,n} - h_p) = (L - L_p)/(L_{max,\,n} - L_p)$.

Glossary of Terms

Principal zone:	Zone wherein values of U_c/U_{oc} from Equation 5 decrease from unity to zero.
Primary zone:	Zone between outlet and beginning of principal zone.
Transition zone:	Zone of actual jet wherein pattern of flow in the primary zone changes to that in the principal zone.

---

*Dr. Eng., Bremen, Germany. Visiting Instructor, Department of Mechanical Engineering, Kansas State College, during the year 1954-55.

†Personnel: W. O. Huebner, *chairman;* H. R. Limbacher, *vice chairman;* P. A. Argentieri, H. F. Brinen, J. C. Davidson, S. H. Downs, S. F. Gilman, Linn Helander, F. B. Holgate, W. W. Kennedy, W. B. Kirk, Alfred Koestel, E. J. Kurek, J. N. Livermore, R. D. Madison, L. G. Miller, H. B. Nottage, L. R. Phillips, C. H. Randolph, N. S. Shataloff, R. D. Tutt, Hrant Yousoufian.

[2] Exponent numerals refer to References

For presentation at the Semi-Annual Meeting of the American Society of Heating and Air-Conditioning Engineers, Murray Bay, Que., Canada, June 1957.

Journal Section

The empirical equations based on n having a value of ½ are summarized in Table 1. $L_{\max,\,n}$ in this table is not the same as $L_{\max}$, the sensible throw of the jet. For throws in excess of 8 outlet diameters the latter is properly evaluated by:

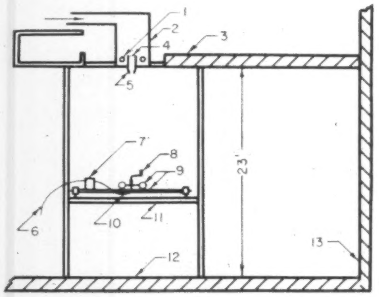
$$(L_{\max}/D_o)(\pm 10\%) = 1.66\ B_{oc}{}^{1/2} \text{ or } 1.7\ \overline{B_o}{}^{1/2}$$

$L_{\max,\,n}$ in Table 1 is an extrapolated value of the throw, found to be the best value for correlating the data on centerline velocities with travel.

Test Procedures and Equipment

The test rig was similar to that described in Reference 1 (see Fig. 1). The plenum chamber shown in Fig. 1 was attached to the outside of a balcony which extended laterally from the plenum chamber and formed a partial ceiling flush with the bottom of the plenum chamber. Air was delivered through a long duct to the plenum chamber whose base was 23 ft above the floor. A 4-in. *ASME* long-radius nozzle was located at the bottom of the plenum chamber. Screens were installed in the plenum chamber to produce a symmetrical and uniform velocity distribution. In contrast to the previous setups, however, heat was supplied solely by electric light bulbs located around a 1-ft diameter tube, 2 ft long, located inside the plenum chamber immediately ahead of the nozzle. The voltage of the bulbs was controlled with a variable auto transformer. By supplying the heat immediately before the nozzle, the *thermal inertia* of the system was minimized and the temperature of the air leaving the nozzle responded very quickly to changes in the heat supply. This was essential because it proved to be necessary to check and to adjust the temperature at the outlet continuously in order to obtain reproducible data. A thermocouple was installed at the outlet to measure the outlet air temperature. Similarly, it proved essential to check and to adjust continuously the plenum chamber pressure, and by this the outlet velocity. During the tests, the heater voltage and fan speed were continuously adjusted to maintain the desired outlet conditions.

The impact tube and the thermocouple for the measurements in the jet were mounted on an electrically driven elevator and carriage as described in References 1 and 2. The



1. Electric bulbs.
2. Thermally insulated plenum chamber.
3. Balcony.
4. Screen.
5. 4-in. ASME nozzle.
6. Electric wiring to electronic airspeed indicator.
7. Condenser head.
8. Impact tube.
9. Carriage.
10. Hose connection.
11. Elevator.
12. Floor.
13. Wall.

Fig. 1 — Test Setup

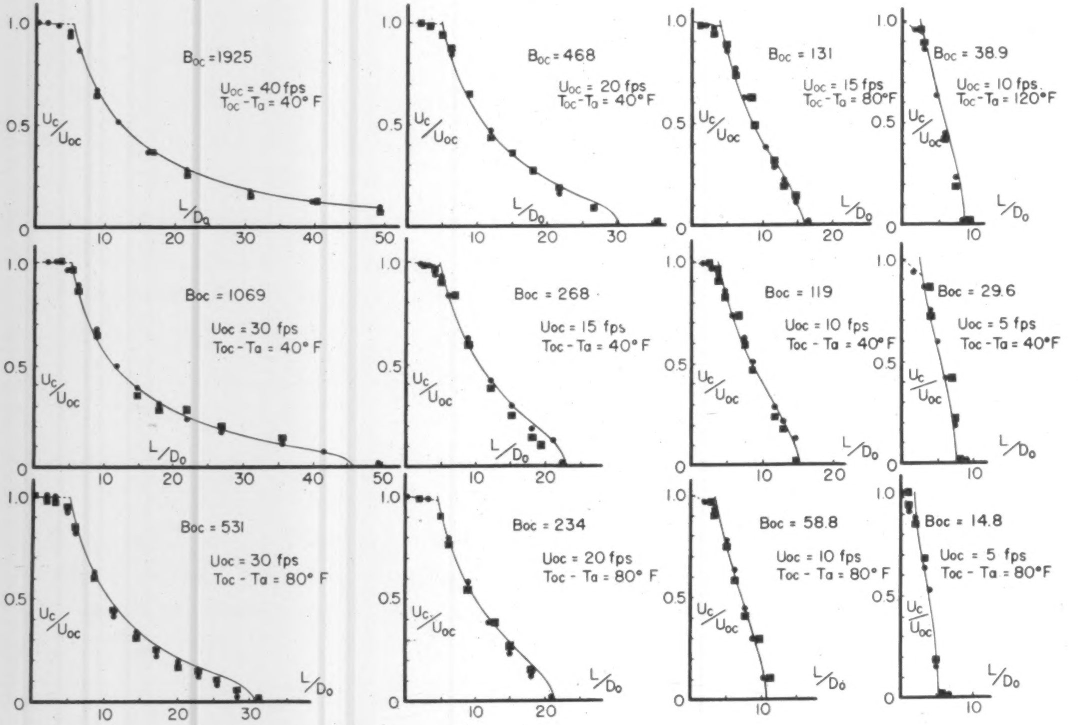


Fig. 2 — Ratio of velocity, U_c, on axis of jet at distance L ft below outlet to velocity at outlet, U_{oc}, plotted against the ratio L/D_o, where D_o is the diameter of the outlet. Solid line represents Equation 5, with n equal to ½. The dotted line represents Equation 10

impact tube and the thermocouple could be positioned from the floor level with an accuracy of 0.1 in.

For measuring and recording the velocity pressures in the jet, an electronic pressure differential recorder (see Reference 3, page 364) was used. A short rubber hose connected an impact tube with the pressure sensitive element of this recorder. This pressure sensitive element consisted of a pressure sensitive capacitance, the so-called condenser head of this equipment. In previous tests, this condenser head was located on a table in the instrument room and was connected to a Pitot tube by means of 2 long hoses, one for the impact pressure, the other for the static pressure. In the present case, the condenser head was located on the elevator at the same level as the impact tube and well outside of the air stream. This arrangement was chosen for the following reasons:

1. The shortened hose connection between the impact tube and condenser head minimized the viscosity *dampening* of the fluctuations and reduced the inertia of the air column.
2. Static pressure measurements, always of questionable accuracy in a turbulent jet, could be dispensed with and a simple impact tube could be used for measuring velocities.
3. The necessity of compensating for variations in the temperature of the air in the hose connection between the impact tube and the condenser head was avoided.

For calibration, the condenser head was connected to an analytical balance modified to measure small pressure differentials. The electronic unit was calibrated twice a day.

Test Results and Comparison with Formulas

The tests were run with outlet velocities ranging from 0 to 60 fps and temperatures at the outlet ranging from 0 to 120 deg above the room temperature measured 30 in. above the floor, remote from the jet. The buoyancy numbers (see Nomenclature) ranged from 14.8 to 1925 for heated air. For each set of outlet conditions 2 completely independent tests were run.

For the isothermal jets, the velocities in the principal zone were represented closely by Equation 1.

$$U_c/U_{oc} = 6.4/(L/D_o) \quad \ldots(1)$$

or, still better, by

$$U_c/U_{oc} = 7.6/(L/D_o + 1) - 0.034 \quad \ldots\ldots(2)$$

These formulas for the centerline velocities in the principal zone were valid for $L/D_o \geq 8$.

In the transition zone of the isothermal jet, *i.e.* for L/D_o from 3 to 8, the data were represented very closely by the parabola:

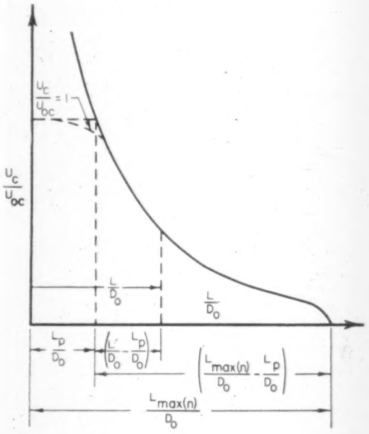


Fig. 3 — Plot of U_c/U_{oc} vs L/D_o to illustrate significance of symbols L_p/D_o, $L_{max,\,n}/D_o$, and X. $h = L + h_o$; $X = (L - L_p)/(L_{max,\,n} - L_p) = (h - h_p)/(h_{max,\,n} - h_p)$; h_o = distance from outlet to point from which h is measured

$$U_c/U_{oc} = -\,0.008(L/D_o)^2 + 0.048(L/D_o) + 0.928 \quad \ldots\ldots(3)$$

Fig. 2 shows the velocity ratio, U_c/U_{oc}, for heated jets as a function of distance down from the nozzle outlet expressed in terms of outlet diameters. As mentioned before, for each set of outlet conditions 2 completely independent tests were run, the measurements of which are marked x and o, respectively. The solid lines represent values of U_c/U_{oc} as they are predicted by the correlating equations employed. For reference purposes, that part of the jet where the solid line decreases from $U_c/U_{oc} = 1$ to $U_c/U_{oc} = 0$ has been called the principal zone, and the part from the outlet to the beginning of the principal zone has been called the primary zone.

For the principal zone, the correlating equations for U_c/U_{oc}, Equations 4 and 6, were based on, and except for the introduction of the subscript, n, are the equivalents of the equation given in Reference 6:

$$U_c/U_{oc} = bh_p/h\,[1 - (h/h_{max,\,n})^2]^n \quad \ldots\ldots(4)$$

In Equation 4, h_p/h is the usual term for the isothermal jet. The buoyancy force is taken into account by $[1 - (h/h_{max,\,n})^2]^n$, where $h_{max,\,n}$ increases with increasing buoyancy numbers. The factor b is introduced to make $U_c/U_{oc} = 1$ at $h_p/h = 1$, *i.e.* at the beginning of the principal zone.

Writing Equation 4 for $h_p/h = 1$ and $U_c/U_{oc} = 1$ yields:

$$b = 1/[1 - (h_p/h_{max,\,n})^2]^n = 1/[1 - m^2]^n$$

where

$$m = h_p/h_{max,\,n}.$$

Equation 4 can then be written:

$$U_c/U_{oc} = \{h_p/[1 - m^2]^n\}\{[1 - (h/h_{max,\,n})^2]^n/h\} \quad .(5)$$

Equation 5 corresponds to Professor Koestel's equation (Reference 4, Equation 3), if $h_p/(1 - m^2)^n$ is a constant and if the exponent n is 1/3.

With $(h - h_p)/(h_{max,\,n} - h_p) = (L - L_p)/(L_{max,\,n} - L_p) = X$ (see Fig. 3) Equation 5 becomes

$$U_c/U_{oc} = m\{1 - [(1 - m)X + m]^2]^n/[1 - m^2]^n\,[(1 - m)X + m] \quad \ldots\ldots(6)$$

Equation 6 is applicable in the principal zone of the jet. This equation was used as the curve matching equation. For each value of n selected, a series of values was assigned to m. Then for each value of m, a curve of U_c/U_{oc} *vs.* X was plotted on tracing cloth. The curves so formed for values of n between 1/3 and unity were matched against test values of U_c/U_{oc} plotted against X, and the values of *n* and *m* that gave the best match were noted. In each case, preliminary estimates of L_p and $L_{max,\,n}$ were made and refined in the process of matching. By this procedure, curve-matching values of L_p and $L_{max,\,n}$ consistent with the experimental data and the best matching value of n were obtained.

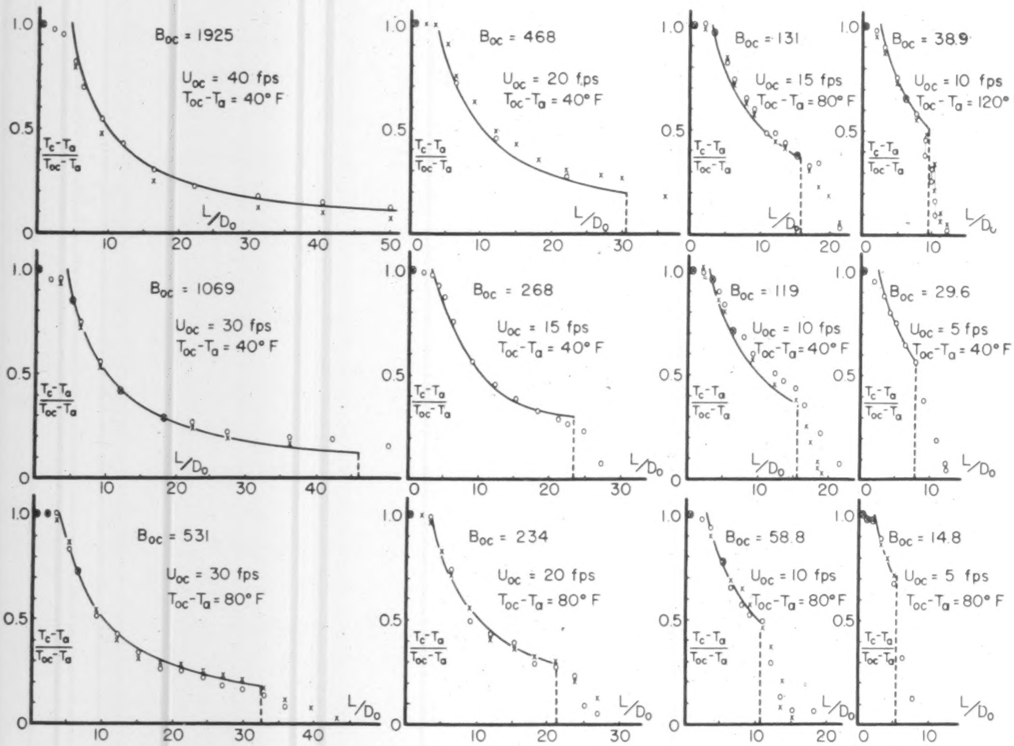


Fig. 4 — Temperature elevation, ($T_c - T_a$), at vertical axis of jet expressed as a ratio of ($T_{oc} - T_a$), the temperature elevation at center of outlet, and plotted vs distance from outlet, L/D_o, in outlet diameters. The solid line represents Equation 11 with values of L'_p/D_o and h'/D_o evaluated from Equations 13 and 14. The vertical dotted line marks the point at which $L/D_o = L_{max,\,n}/D_o$

As was previously stated the best correlation of the experimental data on centerline velocities was obtained by setting n equal to ½ and evaluating $L_{max,\,n}/D_o$ by the equation:

$$L_{max,\,n}/D_o = (2B_{oc})^{1/2} \quad .....(7)$$

A satisfactory correlation of centerline velocities was also obtained by setting n equal to unity and L_{max}/D_o equal to $1.66B_{oc}^{1/2}$, that is, to the value of L_{max}/D_o that was previously reported for values of throw in excess of 8 outlet diameters[2].

Values of L_p and *m* for n = ½, obtained by the procedure outlined, were plotted as functions of the buoyancy number. The curves formed narrow and consistent bands, which were closely represented by:

$$m = 84.4/(B_{oc} + 138) + 0.06 \quad ....(8)$$

$$L_p/D_o = [172/[1 + 172/(\sqrt{2B_{oc}} + 7.5)^2]]^{1/2} - 7.5 \quad ....(9)$$

It is evident that here again the buoyancy number is the influencing factor which governs the behavior of the jets.

The solid line in the graph of Fig. 2 represents the U_c/U_{oc} values, as predicted by the Equations 5 or 6 and Equations 7, 8 and 9. Equations 7 and 9 give $L_{max,\,n}/D_o$ and L_p/D_o; Equations 5 or 6 and Equation 8 give U_c/U_{oc} between values of $L_{max,\,n}/D_o$ and L_p/D_o.

Neglecting any change in the centerline temperature within the primary zone, thereby considering the buoyancy force and the resulting deceleration along the centerline as constant, the equation:

$$U_c/U_{oc} = \sqrt{[1 - 2g[(T_{oc} - T_a)/T_a][L/U_{oc}^2]]} = \sqrt{[1 - (2/B_{oc})(L/D_o)]} \quad (10)$$

is obtained for U_c/U_{oc} in the primary zone. The graphs of Fig. 2 show Equation 10 plotted as dotted lines.

Fig. 4 shows the centerline temperature measurements in terms of the temperature ratio, $(T_c - T_a)/(T_{oc} - T_a)$, plotted against distance from the nozzle outlet expressed in outlet diameters.

The vertical dotted line in each graph indicates the point where L/D_o equals $L_{max,\,n}/D_o$ with n equal to ½. It is obvious from Fig. 4 that $(T_c - T_a)/(T_{oc} - T_a)$ is not yet zero at that point. A clearly significant elevation of temperature, $T_c - T_a$, was observed at $L_{max,\,n}$ for all values of this quantity evaluated with n between 1/3 and unity; *i.e.*, over the full range of possible locations of the bottom of the jet as determined from velocity measurements alone. This indicates clearly that the length of the jet based on velocity measurements was, in all cases, shorter than the length based on temperature measurements. For small buoyancy numbers, $(T_c - T_a)/(T_{oc} - T_a)$ had a value of 0.5 or more where L equals $L_{\max,\, n\, =\, 1/2}$. Between the outlet and this point, the centerline temperature at a given point fluctuated from 2 to 4 deg for the same outlet conditions. Below this point, however, the temperature fluctuated from 15 to 20 deg. Therefore, any measurements in the area below the level of $L_{\max,\, n\, =\, 1/2}$ can give only approximate values, from which the instantaneous values may differ considerably.

Measured values of $(T_c - T_a)/(T_{oc} - T_a)$ can be fitted to a curve of the form:

$$(T_c - T_a)/(T_{oc} - T_a) = h'_p/h' = (L'_p + h'_o)/(L + h'_o) \qquad \ldots\ldots\ldots(11)$$

To determine the constants L'_p and h'_o, the reciprocal temperature ratio, $(T_{oc} - T_a)/(T_c - T_a)$, was calculated from the measured values and then plotted against L/D_o. From Equation 11 the reciprocal temperature ratio is:

$$(T_{oc} - T_a)/(T_c - T_a) = h'/h'_p \qquad \ldots(12)$$

It follows from this equation that a straight line is formed when $(T_{oc} - T_a)/(T_c - T_a)$ is plotted against L/D_o. The intersection of this straight line with the abscissa gives h'_o/D_o. L'_p/D_o is the value of L/D_o when $(T_{oc} - T_a)/(T_c - T_a) = 1$.

L'_p and h'_o determined by this method can be closely represented by:

$$L'_p/D_o = 1.48\ B_{oc}^{0.14} \qquad \ldots(13)$$

$$h'_o/D_o = [4400/(B_{oc} + 820)] - 0.51 \qquad \ldots\ldots(14)$$

With Equations 11, 13, and 14 it is possible to predict the distribution of $(T_c - T_a)/(T_{oc} - T_a)$. These predicted curves are shown in the graphs of Fig. 4 as solid lines. These formulas should not be applied below the point at which L/D_o equals $\sqrt{(2B_{oc})}$. In Fig. 4, the curves end at this value of L/D_o. Fig. 4 shows that the equations represent the measured values fairly well.

Conclusions

The centerline velocities showed fluctuations of 2 different kinds: Fluctuations of the first kind were those with a *high frequency* or short period of the order of one second to a few seconds per cycle. Relative to the local velocity, these fluctuations became bigger and bigger with increasing distance from the nozzle. In absolute magnitude they were small in the primary zone, large in the transition zone and in the first part of the principal zone, and again rather small in the final part of the jet. By recording the instantaneous centerline velocities, it was possible to determine their time mean value. This mean value was called the centerline velocity. Fluctuations of the second kind were much slower and completely irregular. For example, it was found that the time mean values, evaluated over intervals of say 10 sec, might be constant for 2 min, 5 percent lower for the next ½ min, at the original value for the next minute, and again 5 percent lower for several minutes. These irregularities may have been caused by movements of the centerline of the jet. The jet was located in a large hall with tight walls, closed windows, and closed doors and with a relatively uniform temperature in the space surrounding the jet. There was, therefore, no apparent reason for variations in the location of the axis of the jet. Nevertheless, imperceptible variations in the air movement in the hall may have had a considerable influence on the location of the centerline of the jet. The greater the distance down from the nozzle, the greater were the variations in the location of the center of the jet. On the other hand, the velocity profiles became flatter so the variations had less effect on the measured values of velocity. Therefore, the influence of the centerline shifts on the measurements was about the same over all of the principal zone.

Every possible care was taken to make certain that the actual centerline values were measured. Due to the irregular fluctuations, however, no procedure or method for precisely doing this was developed.

The temperature fluctuations influenced the accuracy of the measurements to a much smaller degree than did the velocity fluctuations. The temperature fluctuations were also much more regular with the exception of the fluctuations encountered in that part of the jet below $L_{\max,\, n\, =\, 1/2}$.

Equations 4, 5, and 6 were found to best represent the data when n = ½. Actually, the exponent n has a significant influence on the shape of the curve represented by Equations 5 and 6 only near the bottom of the jet, and exponents of 1/3 or even 1.0 could be used to match the experimental data, provided somewhat larger values of *m and* $L_{\max}/D_o$ were used with the larger values of n. With different values of n, the relations between m and B_{oc} would change accordingly.

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Engineering Manpower and Our Laboratory

By B. H. Jennings*

Evanston, Ill.

THIS country is in the midst of the greatest period of industrial growth that has ever existed in the world. This growth would be even more accelerated were it not for the scarcity of trained engineering and scientific manpower which, in some ways, has reached a critical stage. People continuously ask why the supply of trained manpower is inadequate or perhaps more frequently pose the query, why don't the colleges turn out more engineering graduates?

The colleges have struggled valiantly to meet the challenge and an idea of the magnitude of the increase in student numbers can be seen from the figures for recent years and projected estimates:

Years	1954-55	1955-56	1956-57
Bachelor Degrees in Engineering	22,600	26,400	34,400

If the estimate for 1957 is realized this would mean that more than a 50 percent increase in the number of graduates has taken place in a two-year period. This represents a very creditable increase in numbers, and on the surface this might appear sufficient to fill the gap existing in trained manpower. However, this seems highly improbable as the ever-present activity in defense, the effects of increasing population and the continuing high level of industrial activity have created a demand for even more manpower. Gross national product has been steadily moving upward with representative values over a number of years showing:

1955 at	$391,000,000,000
1956 at	$412,000,000,000
1957 estimated at	$423,000,000,000
1960 estimated at	$455,000,000,000

The high level, for the years indicated, is superposed on those years where productivity was still catching up with the deferred civilian demand resulting from the World War and the Korean struggle.

Unfortunately, a satisfactory solution to the trained engineering manpower situation still appears to be lacking. For some time, an insufficient number of young men were entering the colleges and enrolling in engineering programs. The enrollment picture has now drastically changed and large numbers of college students are taking engineering-scientific programs. But a new cause for concern is arising: namely, the apparent limitation in educational facilities. Many schools have reached their capacity for enrolling and training additional students. Others still have space if teaching staff can be found, and thus it is still possible to produce additional numbers of trained graduates. One distressing and still unsolved problem relates to the large number of students who enter the colleges and because of inadequate training at earlier levels are unable to meet the rigors of an engineering program. The question of quality as a concurrent problem in relation to quantity training is ever present.

The situation, though tight, is not an impossible one, and serious thought is being given to ways and means of ameliorating the situation. One solution is to stop using highly trained personnel on routine jobs where less qualified people can be made to serve.

Encouragement can be taken from the fact that hoarding of manpower in excess of real needs is less evident than it was just a few years ago. The military services also have less men fully committed, and a balance of those entering and those leaving military training is being reached.

Finally, more attention is being given to the desirability of using trained personnel for longer periods of life before full retirement.

It is natural that the tightness of available manpower has made itself felt at our Research Laboratory in Cleveland, although it is not so critical there as throughout industry. However, when certain of our planned increases in activity take place we may be unable to obtain full staffing. In an effort to alleviate this possible contingency, last June the Committee on Research passed the following motion:

> THAT the Laboratory go on record as being willing to negotiate with distinguished professors or engineers to work in the Laboratory for a limited period of time on projects of mutual interest. In this connection professors on sabbatical leave might also be invited to come to the Laboratory and work on special fields in heating and ventilating.

This action is still Laboratory policy and could apply to a number of retired or semi-retired research-minded engineers. The staff of the Laboratory will be more than pleased to explore these possibilities with anyone interested. Research in air conditioning can and will add its part to making ours a better world in which to live.

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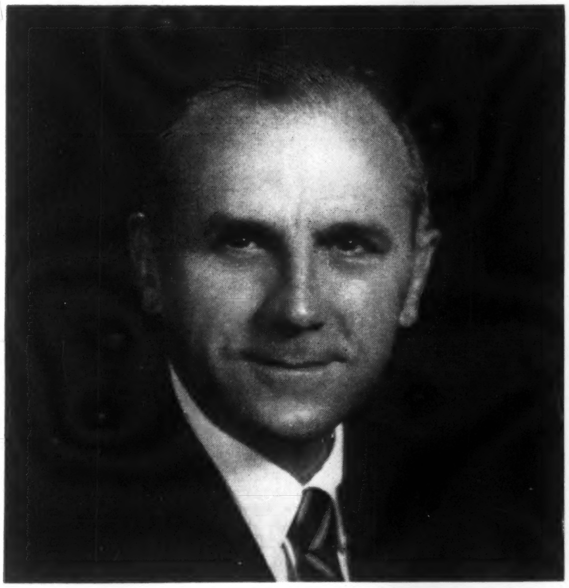
*Past Chairman, Committee on Research.

63rd Annual Meeting Proved Stimulating



John W. James, Chicago, Ill.
President

P. B. Gordon, New York, N.Y.
President-Elect

Attendance records were established at the 63rd Annual Meeting in Chicago, February 25-28, 1957. Total registration was 3257, with 1808 members, 954 guests and 495 ladies, and with visitors from 13 countries.

The program was a full one. There were 6 technical sessions, 2 of which took the form of symposiums, and concurrent sessions were necessary throughout the meeting days. In addition to the 6 technical sessions with 13 papers, there were numerous committee meetings. That such a program, as worked out under the leadership of P. J. Marschall, who acted as general chairman of the Committee on Arrangements of the Chicago Chapter, was a success was attested not only by the large registration, but also by the unprecedented attendance at the sessions themselves.

First Session, Monday, Feb. 25, 9:30 a.m.

Meeting in the Waldorf Room of the Conrad Hilton Hotel, Chicago Ill., Pres. John W. James, Chicago, Ill., called the session to order. He at once presented P. J. Marschall, North Chicago, Ill., general chairman of the Committee on Arrangements, who expressed the pleasure of the Chicago Chapter in welcoming the meeting. Mr. Marschall also outlined the program features as arranged for the meeting and asked that all attend as many of them as possible.

President James then read his report in which he mentioned many of the outstanding events which had taken place during the year.

Report of President

Tracing the progress of any Society year can hardly be attributed to the efforts of a single administrative group, as many of the accomplishments in 1956 were only made possible by the effective groundwork initiated and carried forward during previous administrations. In recent years much credit is certainly due the Long-Range Planning Committee for contributing substantially to the integration of our varied activities and charting a course of sound progressive expansion to meet the needs of the profession.

Membership: When we last met in Chicago 4 years ago, there were about 9000 members on the rolls, and today there are in excess of 11,000. Similarly, the chapter growth over the same period has steadily increased from 52 to 67. We were pleased to receive petitions from 6 localities for chapters during 1956 and interestingly, 2 of these were in widely separated areas of Canada, 3 in Texas and the 6th in the Quad-city area of Illinois and Iowa.

In 1956, we elected and reinstated 1328 members and, with 663 dropped, resigned and deceased, the net gain for the year was 665. Signs of the times indicate that for the 8th consecutive year, 1957 will probably break all previous records for total sales volume in the entire heating, ventilating and air-conditioning industry, with a total of 3.4 billion dollars and by 1960 this sales volume is predicted to reach 4 billion dollars. If this gradual sales growth in the industry is maintained, it is probable that the Society will reach a total membership of around 12,500 in 1960 and the total number of chapters will be 75 or more. During 1956, the Membership Committee completed a comprehensive report on potential membership development that has already begun to form a definite pattern for planned growth.

While on the subject of membership, I would like to pay a special tribute to our faithful Admission and Advancement Committee which assembles monthly to process and assign grades of membership. With the meager information submitted on some applications, one marvels at the ability of this committee to judge the applicant's qualifications for proper grade status.

Regional Plan: This was the first year that the plan for operating the chapters on a regional basis moved into full swing and although it may be a bit too early to appraise the plan, there have been many favorable reactions from the chapter representatives. The general feeling seems to be that this method of operation provides a more favorable arrangement for grass-root ideas to advance and be debated and considered for improving Society policies, procedure and operation. With the natural expected growth of the Society during the next few years, this plan certainly offers a reasonable solution to the increasing burdens delegated to the Officers, who find contacting the chapter delegates at small regional meetings more workable than the former arrangement of visiting each chapter. An assistant secretary was engaged in 1956 to cooperate more fully in administering the affairs of chapters from the Headquarters' Office.

Finances: I am glad to report that the finances of the Society are in good condition. Like any other organization, operating costs are constantly increasing, and this means we must be continually alert to other sources of income so as to improve our services to the members, chapters and profession.

Research and Standards: One merely has to attend a Research Technical Advisory Committee or Code Committee meeting, let alone a Committee on Research or Guide Committee meeting to realize the loyalty and devotion of the Society membership to the basic concept of our Charter, and that is to unselfishly advance the arts of our branch of engineering for the benefit of the general public. During the past 2 years, our Research Program has steadily moved forward under the leadership of the policy-making Committee on Research and through the loyal cooperation of our staff members at the Research Laboratory in Cleveland and in the several cooperating institutions.

To support this enlarged research program, the Society is especially indebted to many individuals and industrial companies for their generous financial contributions, and participation in the Exposition.

Acting upon the recommendations of the increasingly active Standards Committee, the Council adopted a new definition of air conditioning at the June 1956 meeting. Also to bolster and support the Council's desire to develop more codes in our field of interest, a new technical assistant was appointed in 1956.

Publications: The decision to increase the format of the 1959 edition of The Guide has imposed heavy burdens on our Guide Committee, but with the assistance of the members of the Special Guide Advisory Committee who are planning the overall transition program, the membership and industry can look forward to an enlarged handbook that will make available more space for useful, technical data and manufacturers' catalog information.

Previously scheduled successful dual technical sessions and symposiums has encouraged the Program and Papers Committee to continue this arrangement for the Chicago meeting. Symposium digests appear in the monthly Journal, but orders for separately published bulletins covering the complete symposium talks and discussions has demonstrated the desire of members to obtain this information. The important Publication Committee has submitted a plan of streamlining the editorial policy of the Society Journal so that the papers may be presented in more readable form and a long-range plan may be instituted to produce a continual flow of paper submissions. Transactions for the first time in many years were printed and distributed within the year that the meetings took place.

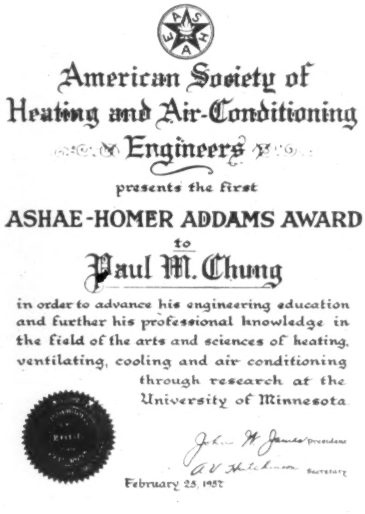
Paul M. Chung, graduate student at the University of Minnesota, is presented by Paul K. Addams with the certificate issued to him as a result of his receiving the first ASHAE-Homer Addams Award

Honors and Awards: After several years of careful study, a special Committee has been delegated with the responsibilty of administering all honors and awards under a plan approved by Council. At this meeting, the Society will confer the grade of Fellow on the first group of 5 members who were selected because of their attainment of unusual distinction and substantial contributions to our profession.

This committee developed a procedure for presenting the ASHAE-Homer Addams Award on a rotational basis to a graduate student engaged in research at one of the colleges or schools of engineering where the Society has been engaged in cooperative work during a previous two-year period. The school selected in 1956 was the University of Minnesota and the first recipient of this honor will be presented with the award at this meeting.

Public Relations: Two years ago, we engaged a director of public relations to carry forward a long-range program of publicity. Under the direction of a hard-working Public Relations Committee, we are pleased to report that much progress has been made in acquainting the membership and the public with significant Society accomplishments.

During 1956, our election to the *Engineers' Joint Council* was confirmed and the Society has already taken steps to cooperate more fully by appointing representatives on *EJC* working committees. The primary objective of *EJC* is to provide a central coordinating agency for the unification of the profession. Present constituent members of the Council include *ASCE*, *ASME*, *AIEE*, *AIME*, *AIChE*, *AWWA*, *SNAME*, *ASEE*, *ASRE* and ourselves. Along with other engineering societies in *EJC*, we are acting as a sponsor for the Nuclear Congress which is to be held in Philadelphia, March 11 to 15, 1957. Early in the year, the Council authorized the appointment of a Nuclear Energy Engineering Committee which released a report of special interest to the membership in the November 1956 Journal.



American Society of
Heating and Air-Conditioning
Engineers
presents the first
ASHAE-HOMER ADDAMS AWARD
to
Paul M. Chung
in order to advance his engineering education
and further his professional knowledge in
the field of the arts and sciences of heating,
ventilating, cooling and air conditioning
through research at the
University of Minnesota

John W. James President
A V Hutchinson Secretary
February 25, 1957

In December, the first meeting of representatives of the newly appointed Joint Committee of the *American Institute of Architects* and ASHAE assembled in Washington, D. C., to develop a basis of encouraging cooperation between architects, consulting engineers, and the industry to improve the effectiveness of air-conditioned buildings.

Discussion was continued during 1956 between representatives of *ASRE* and ASHAE to establish cooperation between the respective Societies in fields of mutual interest, and a number of constructive recommendations have been prepared.

In the spring of 1956, and at no expense to the Society, I found it possible to represent the membership at the British Industries Fair in London, where I was afforded the distinction of being presented to Her Majesty, The Queen, and H.R.H., The Duke of Edinburgh, along with 5 other industry people from different parts of the world. Cordial relations were established with the officers of the *Institution of Heating and Ventilating Engineers* and we are honored at this meeting to have their president, J. Clifford Byles, in attendance. On this same European trip, I had the privilege of extending greetings from our Society to engineering groups in 7 other western countries and was invited to read a paper before a Swedish heating and ventilating group in Stockholm.

None of these happenings could have been realized without the loyal support of a cooperative Headquarters' Staff. I have had the privilege of intimately knowing many in this group for a long period of years and I now wish to publicly acknowledge, with the highest commendation, the long years of loyal devotion which this group has rendered to the membership.

Before closing this report, I want to express appreciation to my business associates who virtually extended me a leave of absence so that I might have the opportunity to serve the Society. Also, I want to thank the other officers, members of Council, chapter officers, various committees and members who have contributed so much to further the objectives of our Society. All have been most kind and cooperative and I wish it were possible for me to thank you individually, but I do want you to know I am grateful for the inspiring experiences and privileges you have extended to me.

It has been a real pleasure to serve you.

Respectfully submitted,
JOHN W. JAMES, *President*

Report of Executive Secretary

As the next order of business, President James asked that A. V. Hutchinson, New York, N. Y., executive secretary, present his report. Mr. Hutchinson referred to the successful introduction of the Regional Plan for Chapter Operations; to staff personnel changes; to the completion of the 1956 Transactions during the year; to the success of the new plan for JOURNAL subscription; to the growth in membership, and the unfortunate loss of two past presidents; to the satisfactory expansion in number of chapters and to the appearance of additional chapter publications. He also observed that the required administrative duties assigned to the headquarters staff have been carried on as required by the By-Laws. The Society proceedings, Council and committee minutes have been recorded and transmitted. A record number of membership applications have been processed and notification of elections and membership certificates have been furnished. Address changes and correspondence have required more help in the Membership Department. Budget statements have been furnished monthly to members of the Council and the bookkeeping load has been greatly increased by the membership growth and the greater volume of transactions including our publications, dues receipts and the corresponding disbursements which must be recorded.

Mr. Hutchinson also presented the report of Council.

Report of Council

The 1956 annual report of the Council of the Society as required by the Membership Corporations' Law, is presented herewith:

Four regular meetings of the Council were held during the calendar year, 1956, the organization meeting being convened January 26 at the Sheraton-Gibson Hotel, Cincinnati, Ohio. Personnel of the Council, General and Special Committees authorized by the By-Laws were announced by Pres. John W. James.

At the organization meeting, the Council approved 7 Regional Areas for chapter operations and specified the chapters in each region. Among the important actions taken during the year by the Council were:

1. Approved Charters for 6 chapters.
2. Recommended honorary membership for 3 persons of professional distinction and nominated a fourth for honorary membership in 1957.
3. Conferred the new grade of Fellow upon 5 members.
4. Elected 15 members to Life Membership.
5. Approved an official definition of air conditioning.
6. Authorized the first ASHAE-Homer Addams Award.
7. Voted that Prof. Maurice K. Fahnestock be awarded the F. Paul Anderson Award for 1956.
8. Approved the Operational Guide for the Gustus L. Larson Award submitted by Wisconsin Chapter, and authorized the first Larson Award.
9. Approved the Operational Guide for the Long Range Planning Committee.
10. Noted the Society's election as a member of the *Engineers Joint Council* and named First Vice-Pres. P. B. Gordon and Second Vice-Pres. E. R. Queer to serve respectively as the Society's representative and alternate on the Board of *EJC*.

New By-Laws on membership grades to conform to *ECPD* recommendations, submitted to the membership in December 1955, as well as proposed changes in chapter operations and Nominating Committee procedure, were adopted.

SOCIETY BOOTH OUTSTANDING AMONG EXHIBITS

1894
1957
DEDICATED TO THE ADVANCEMENT OF PROFESSIONAL KNOWLEDGE
AMERICAN SOCIETY OF HEATING AND CONDITIONING ENGINEERS
MEMBERS
67 CHAPTERS
AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

Society booth at the 13th International Heating and Air-Conditioning Exposition. The Exposition was the largest ever, attracting more than 470 exhibitors and an estimated attendance in excess of 30,000

Journal Section

The membership changes included establishment of the honorary grade of Fellow and the designation of all Junior Members as Associate Members.

Other changes were the outlining of a regional plan for chapter operations; changes in dues to conform to the revised membership grades; providing for 7 Council members to serve as regional directors; providing for a new Council Committee (Regions Central Committee) and a new General Committee (Chapters Regional Committee) to replace, respectively, the Chapter Relations Committee and the Chapters Conference Committee; a minor revision in the procedure of the Admission and Advancement Committee; and a new term of office for the Guide Committee in order to increase its effectiveness and, an increase in the number of alternates on the Nominating Committee and provision for payment of members' transportation to 2 meetings instead of to 1.

The grade of Fellow — a grade newly established — was conferred on five eminent members. *(l. to r.)* S. R. Lewis, W. L. Fleisher, L. N. Hunter, J. Donald Kroeker (the fifth, C. S. Leopold, was unable to be present)

Charter Grants During 1956: (1) Northern Alberta Chapter (Canada) — Approved January 22, 1956; (2) Austin Chapter (Tex.) — Approved April 8, 1956; (3) El Paso Chapter (Tex.) — Approved June 17, 1956; (4) Illinois-Iowa Chapter (Ill.) — Approved June 17, 1956; (5) Chapitre de la Ville de Quebec (Canada) — Approved October 21, 1956; (6) Fort Worth Chapter (Tex.) — Approved October 21, 1956.

Honorary Membership: Elected to Honorary Membership were the Honorable Herbert Hoover, New York, N.Y.; Dr. Milton S. Eisenhower, President, Johns Hopkins University, Baltimore, Md.; Dr. Charles F. Kettering, researcher, inventor and industrialist, Dayton, Ohio. Proposed for Honorary Membership in 1957 was Dr. Arthur C. Willard, President Emeritus, University of Illinois, Urbana, Ill.

Life Membership: Members elected to Life Membership were M. C. Beman, H. J. Church, G. M. Comstock, Carl H. Flink, I. H. Geiger, D. C. Jardine, H. L. Janet, R. L. Leilich, N. J. Mathey, C. R. Morris, C. F. Olsen, J. L. Pfuhler, H. P. Reid, R. B. Stanfer, M. S. Wunderlich.

Fellows: The Council on October 21, 1956, conferred the grade of Fellow upon Walter L. Fleisher, Sr., L. N. Hunter, J. Donald Kroeker, Charles S. Leopold and Samuel R. Lewis.

Definition of Air Conditioning: On April 8, 1956 the Council approved an official definition of air conditioning.

ASHAE - Homer Addams Award: The first Homer Addams Award was authorized on June 17, 1956. It was presented during the 1957 Annual Meeting to Paul M. Chung, St. Paul, native Korean and graduate student of the University of Minnesota.

The Society was greatly honored by the presence of J. Clifford Byles, president of the Institution of Heating and Ventilating Engineers of Great Britain

Gustus L. Larson Award: The first Gustus L. Larson Award, approved by Council October 21, 1956, was made to Ronald L. Kausch, senior in mechanical engineering at the University of Wisconsin, on November 15, 1956, at a joint dinner meeting of the Rock River Valley Section and the University of Wisconsin Section of *ASME*.

Deaths: Two past presidents of ASHAE passed away during 1956, and one died during January of this year. They were Dr. B. M. Woods, September 7, 1956; Ernest Szekely, November 29, 1956, and Dr. C.-E. A. Winslow, January 8, 1957.

Finances: As required by Section 46 of the Membership Corporations' Law of the State of New York the following report is presented by the Council and filed herewith:

Assets — October 31, 1956

The Society has the following Assets:

Land and Laboratory Buildings at Cleveland, Ohio	$ 81,012.89
Furniture and Equipment, Tools, etc., at New York and Cleveland	39,054.60
On deposit in New York and Cleveland banks	214,257.50
Securities (United States and Utility Bonds) with Bankers Trust Co., New York as custodian	133,294.48
Accounts Receivable	12,764.89
Inventory Items	8,251.98
Deferred Items	12,254.66
TOTAL ASSETS - 1956	$500,891.00*
TOTAL ASSETS - 1955	494,929.14
INCREASE FOR THE YEAR	$ 5,961.86

Liabilities — October 31, 1956

The Society has the following Liabilities:

Accounts Payable	$ 238.17
Federal Withholding Taxes	1,457.04
Accrued Accounts	15,580.25
Deferred Income:	
Research Projects	10,556.16
Prepaid Dues, Initiation Fees, etc.	13,272.17
Reserve for Fluctuation in Canadian Exchange	35.29
TOTAL LIABILITIES	$ 41,139.08
Net Worth (Funds)	459,751.92
TOTAL LIABILITIES AND NET WORTH	$500,891.00

At the end of the fiscal year, October 31, 1956, the Balance Sheet shows the Society's net worth as $459,751.92 compared to $422,190.70 on October 31, 1955, a net gain of $37,561.22.

Total cash in New York and Cleveland banks $214,257.50 consisting of $54,764.28 in General Operating Fund, $38,112.52 in Reserve Fund, $321.44 in F. Paul Anderson Fund, $72,249.42 in Research General Fund, $28,639.62 in Research Reserve, $777.26 in Research Endowment, $5,974.13 in Building Maintenance Reserve Fund, $3,346.49 in Building Fund, $10,022.12 in the ASHAE - Homer Addams Fund, and $50.22 in the Educational Fund, Life Members.

Now in the Custodian Account of the Bankers Trust Co., New York, there are securities of the United States and Canadian Governments and a utility which cost as follows: General Fund $3,782.36; Building Fund $35,462.00; Reserve Fund $88,166.50 and F. Paul Anderson Fund $1,000.00.

The Society's Reserve Fund was increased by the addition of $9,741.00 Admission Fees and $2,452.13 Interest earned on Savings Bank Accounts and Securities. This is an increase of $12,193.13 bringing the Reserve Fund to $130,119.29. The Research Fund was increased by the addition of $1,270.75 Interest Earned on Savings Accounts. During the year $25,000.00 of this fund was transferred to Research General Fund. As of October 31, 1956 the Research Reserve Fund had a balance of $28,639.62.

The Sources of Society Income were:

Admission Fees and Dues	$158,561.13
Publications	227,625.60
Interest	664.27
From Research	208,398.05
Other Income	1,197.01
TOTAL	$596,446.06

Society Expenditures were:

Meetings, Committees and Chapters	$ 31,252.86
Publications	140,489.34
Headquarters	173,484.59
Research	218,187.38
TOTAL	$563,414.17

The insurance coverage of the Society is as follows: Fire for Buildings $201,000.00; for Contents $144,500.00; Sprinkler $12,000.00; Automobile Comprehensive Public Liability $100,000-300,000.00; Property Damage $25,000.00; Medical Payments

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*After elimination of $5,459.97 intra-fund. receivable and payable.

$1,000.00; Bodily Injury $25,000-100,000.00; Public Liability, Premises, New York and Cleveland $100,000-300,000.00; Fidelity Bonds on Officers and all Employees $20,000.00. Workmen's Compensation is carried in New York and Ohio as required by law.

The Society has contributed to the Employees Retirement Plan Trust $2,875.61 and the participating employees contributed a substantially similar amount deducted from salary.

Membership: The Society admitted the following members in the grades indicated since January 1, 1956:

Life Members (Transfer 15)	
Members	336
Affiliates	318
Associates	456
Junior Members* (January 1956 selection)	22
Students	176
Total	1,308

During the period January 1, 1956 to January 15, 1957, a total of 20 members in the Member, Associate Member, and Affiliate grades were reinstated; a total of 423 in all categories were dropped from the rolls; 184 resigned, and death claimed 56.

Net gain of members was 665. The overall membership status from January 1, 1956 as compared with January 15, 1957 is as follows:

	January 1, 1956	January 15, 1957
Honorary	1	4
Presidential Members	24	21
Life Members	218	226
Fellows	—	5
Members	4,424	4,691
Associate Members	1,813	4,115
Affiliates	1,752	1,876
Junior Members*	2,120	—
Students	124	203
	10,476	11,141

The names and addresses of the candidates for membership were published in the Journal of the Society each month during the year and are on record in the Secretary's office. The present membership total is 11,141.

Respectfully submitted,
John W. James, *President*
Ralph A. Sherman, *Treasurer*

Report of Treasurer

The treasurer of the Society, R. A. Sherman, Columbus, Ohio, then reported to the meeting. His material consisted of two parts, *viz*: a summary of the operations of the treasurer's office and also the Accountant's Report which appears on pages 148 and 149. In his report of the treasurer's operations, Mr. Sherman indicated that from a Society gross income of $596,446.06, there was allocated to Research:

Dues (40% of Members, Associates over 30, and Affiliates)	$ 79,491.75
Research contributions	
Received in fiscal year	115,534.63
Deferred from prior years	12,890.32
Interest	481.35
	$208,398.05

To this, the Council added $25,000 from the Research Reserve, from the 1955 Exposition, making a total available for Research of $233,398.05. Thus, based on the receipts of the current year, the funds available for research were 35 percent of the current total Society receipts; including the allotment from the Research Reserve, they were 37.5 percent of the current receipts.

Said President James, "This is a proud moment in the history of our Society. Dr. Arthur Cutts Willard is President Emeritus of the University of Illinois. He has contributed brilliantly to science and engineering in heating, ventilating and air conditioning. Holland Tunnel Ventilation Consultant, leader of research teams which developed guiding principles for today's furnaces, boilers and air conditioning, collaborator with medical scientists in pioneering investigation of atmospheric environmental influences on mankind, he is a past president of the Society (1928) and winner of the F. Paul Anderson gold medal award (1936). Dr. Willard, it is my privilege to present this Honorary Member certificate as a token of our high esteem"

Among other points covered, he also stated that a new fund was established during the year which, although now minute, has potentialities for growth. This is the Educational Fund to which contributions of Life Members, now excused from payment of dues, will be credited. The fund is to be used for educational purposes for younger members.

Also, he pointed out that the Research General Fund was substantially increased during the year because of the good record of contributions to the research effort. So many worthwhile research projects need to be done that this reserve will serve a good purpose.

Honorary Membership for Dr. Willard

President James then called attention to the point that Dr. Arthur Cutts Willard, past president of the Society, had been nominated to be an Honorary Member. This nomination was made at the fall meeting of the Council and the By-Laws provide for the election of such a nominee at the Annual Meeting. President James called for a voice vote and Doctor Willard was elected an Honorary Member.

English Guests Speak

President James expressed his pleasure that J. Clifford Byles, president of the *Institution of Heating and Ventilating Engineers*, London, England, was present and asked him for a few words of greeting. Mr. Byles responded with greetings and good wishes from the Institution and the members and Council.

President James also called on F. R. L. White, a past president of the Institution, and a Member of ASHAE. Mr. White responded with remarks concerning the English method of training students in a national college.

Technical Papers

The first technical paper entitled Study of Three Redwood Cooling Tower Packings (published in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, July 1956, p. 139), was presented by its

(*Continued on p. 150*)

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*Automatically became Associate Members upon change in By-Laws adopted at 62nd Annual Meeting, Cincinnati, Ohio, January 26, 1956.

Accountant's Report

Frank G. Tusa & Co., Certified Public Accountants
37 Wall St., New York 5, N. Y.

AMERICAN SOCIETY OF HEATING AND
AIR-CONDITIONING ENGINEERS, INC.
62 WORTH ST., NEW YORK, N.Y.

Gentlemen:

In accordance with the authority contained in the minutes of the organizational meeting of the 1956 Council on January 26, 1956, we have examined the books of account of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. — New York and Cleveland for the fiscal year ended October 31, 1956.

Our examination consisted of the verification of assets and liabilities as of the close of business October 31, 1956 and a review of the operations for the year then ended. The examination was conducted in accordance with generally accepted auditing standards, except as otherwise noted in the comments section and included such auditing procedures and such other tests of the accounting records as we considered necessary under the circumstances.

We are pleased to present our report of this examination which includes the various statements and schedules listed in the table of contents in addition to the following comments that constitute an integral part of this report:

COMMENTS

ASSETS

CASH (Page 13)

On Hand	$ 150.00	
In Checking Accounts	89,864.49	
In Savings Banks	124,243.01	$214,257.50

The cash on hand was physically verified. The cash on deposit was verified by direct communication with all depositories, and the balances reported to us were reconciled to those reflected on the books of account of the Society and found to be correct. A schedule of cash balances in all funds is included on page 13 as a part of this report.

INVESTMENTS AT COST (Page 14) $128,410.86

The securities shown on the subjoined schedule were verified by direct communication with the Bankers Trust Company, where same are deposited for safe-keeping. Securities have been included in the accompanying Statement of Financial Condition at the cost of acquisition plus the accumulated and accrued interest earned thereon.

ACCOUNTS RECEIVABLE $ 22,125.21

Trial balances taken of the membership dues receivable and sundry debtors as of the close of business October 31, 1956 were classified and aged as follows:

MEMBERSHIP

Members	$ 5,357.79
Associate Members (over 30 years)	3,490.25
Affiliates	4,049.00
Associate Members (under 30 years)	2,064.75
Students	15.00
TOTAL	$ 14,976.79

SUNDRY DEBTORS

Unpaid Charges made during 1956	$ 7,148.42

No outside confirmation was requested of accounts receivable. We were, however, by means of other auditing procedures, able to confirm, substantively, the above balances which in our opinion are correct. Consideration was given to all possible uncollectible accounts, and it is our opinion that present reserves for such uncollectibles are ample to cover collection losses that may be incurred.

RESEARCH FUND ACCOUNTS RECEIVABLE

The balance due to the Research Fund from the Society as at October 31, 1956 represents the unpaid balance of 40% of the dues receivable from members, associates and affiliates as of such date.

INVENTORIES

The following inventories were verified either by physical count or by direct communication with the appropriate printers.

TRANSACTIONS	$ 7,064.95
Emblems	1,079.10
Guide Paper	107.93
TOTAL	$ 8,251.98

A Schedule of TRANSACTIONS inventories follows:

Volume	Year	Quantity	Price	Amount
1-55	1895-1949	4,757	.4000	$1,902.80
56	1950	670	2.0800	1,393.60
57	1951	656	2.2750	1,492.40
58	1952	140	1.7960	251.44
59	1953	415	2.0000	830.00
60	1954	273	2.0665	564.15
61	1955	304	2.0742	630.56
		TOTAL		$7,064.95

DEPOSITS RECEIVABLE $ 425.00

The deposit placed with the United Airlines in the sum of $425.00 was verified by direct communication.

ADVANCES $9,060.44

The indebtedness from employees in New York and Cleveland represents advances to the employees retirement plan in the sums of $7,720.67 and $1,339.77 respectively.

PREPAID EXPENSES AND DEFERRED CHARGES $ 2,769.22

The following prepayments have been deferred to future operations:

H.P.A.C. — Subscriptions	$ 619.16
Insurance Premiums — Cleveland	1,967.96
Insurance Premiums — New York	182.10
TOTAL	$ 2,769.22

PERMANENT ASSETS (Page 12) $120,067.49

The Land and Buildings, Instruments, Equipment and Furniture and Fixtures are reflected on the Statement of Financial Condition at cost of acquisition. With the exception of land and buildings all assets have been depreciated at the rate of 10% per annum.

In accordance with the resolution adopted by the council at its meeting of January 23, 1949 depreciation was not provided on the buildings for the current fiscal year.

DEFERRED INCOME $ 10,232.17

The prepaid dues and initiation fees by members and candidates for membership have been deferred to future operations. The membership classification of the dues prepaid by elected members follow:

MEMBERSHIP

Members	$ 5,917.51
Associate Members (over 30 years)	2,281.25
Affiliates	1,185.33
Associate Members (under 30 years)	796.08
Students	52.00
TOTAL	$ 10,232.17

RESERVE FOR BUILDING MAINTENANCE $ 5,974.13

On October 31, 1952 the Council voted:

"That disbursements be made from the Building Maintenance Reserve Fund as authorized by the Building Committee for major items of repair and maintenance, but any balance remaining in the fund beyond the expenditures for each year would go into reserve until the Building Maintenance Reserve Fund reached a total of $10,000.00."

The Building Maintenance Reserve Fund had a balance at the beginning of the current fiscal year of $5,844.99. Appropriate additions and deductions have been made within the fund in accordance with budgetary provisions of the current fiscal year.

FUNDS $459,751.92

There is included as a part of this report a Statement of Funds reflecting the changes that occurred therein during the fiscal year ended October 31, 1956.

INSURANCE

The insurance coverage of the Society follows:

FIRE		
Building (Cleveland)		$201,000.00
Personal Property:		
Cleveland	$104,000.00	
Printers	15,000.00	
New York	25,500.00	144,500.00
SPRINKLER LEAKAGE		
Waverly Press	10,000.00	
Hawes and Petit	2,000.00	12,000.00

NON-OWNERSHIP — AUTOMOBILE — COMPREHENSIVE	
Public Liability	100/300M
Property Damage	25M
Medical	1M
GENERAL PUBLIC LIABILITY — PREMISES	
New York and Cleveland	
Liability	100/300M
Bodily Injury	25/100M
COMMERCIAL BLANKET BOND	
All Employees including the President, Treasurer and Chairman of the Finance Committee	20,000.00

In our opinion, the accompanying Statement of Financial Condition and Statement of Income and Expenses present fairly, the financial condition of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. at October 31, 1956, and the results of its operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

FRANK G. TUSA & CO., CERTIFIED PUBLIC ACCOUNTANTS

Dated December 1, 1956

STATEMENT OF FINANCIAL CONDITION

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC. — New York, N. Y., October 31, 1956

ASSETS

GENERAL FUND			
Society Assets (Per Schedule)			$ 88,507.88
Research Assets (Per Schedule)			81,047.18
PROPERTY FUND (Per Schedule)			120,067.49
BUILDING FUND			
Cash on Deposit		$ 3,346.49	
Investments			
Securities at Cost	$ 35,462.00		
Plus Accumulated Interest	1,003.35	36,465.35	39,811.84
BUILDING MAINTENANCE RESERVE FUND			
Cash on Deposit			5,974.13
SOCIETY RESERVE FUND			
Cash on Deposit		38,112.52	
Investments			
Securities at Cost	88,166.50		
Plus Accumulated Interest	3,840.27	92,006.77	130,119.29
EDUCATIONAL FUND (LIFE MEMBERS)			
Cash on Deposit			50.22
ENDOWMENT FUNDS			
F. Paul Anderson Award Fund			
Cash on Deposit		321.44	
Investments			
Securities at Cost	1,000.00		
Plus Accumulated Interest	12.50	1,012.50	1,333.94
Research Fund			
Cash on Deposit			777.26
Homer Addams Fund			
Cash on Deposit			10,022.12
RESEARCH RESERVE FUND			
Cash on Deposit			28,639.62
TOTAL ASSETS			$506,350.97

LIABILITIES

GENERAL FUND			
Federal Withholding Taxes		1,457.04	
Due To Research General Fund		5,459.97	
Accrued Accounts			
Salaries and Commissions		14,330.25	
Professional Fees		1,250.00	
Sundry Account Payable		100.00	
Deferred Income			
Prepaid Membership Dues			
Elected Members	$ 6,478.54		
Candidates	831.00	7,309.54	
Prepaid Admissions Fees		2,209.00	
Allowance For Fluctuation in Canadian Exchange		35.29	$32,151.09
RESEARCH FUND			
Sundry Accounts Payable		138.17	
Deferred Income			
Unexpended Earmarked Contributions	6,556.16		
Prepaid Dues	3,753.63		
Special Contribution	4,000.00	14,309.79	$ 14,447.96

NET WORTH

Society General Fund	56,356.79	
Research General Fund	66,599.22	
Property Fund	120,067.49	
Building Fund	39,811.84	
Building Maintenance Reserve Fund	5,974.13	
Society Reserve Fund	130,119.29	
F. Paul Anderson Award Fund	1,333.94	
Research Endowment Fund	777.26	
Research Reserve Fund	28,639.62	
Homer Addams Fund	10,022.12	
Educational Fund (Life Members)	50.22	459,751.92
TOTAL LIABILITIES AND NET WORTH		$506,350.97

CONDENSED COMPARATIVE STATEMENT OF INCOME AND EXPENSES

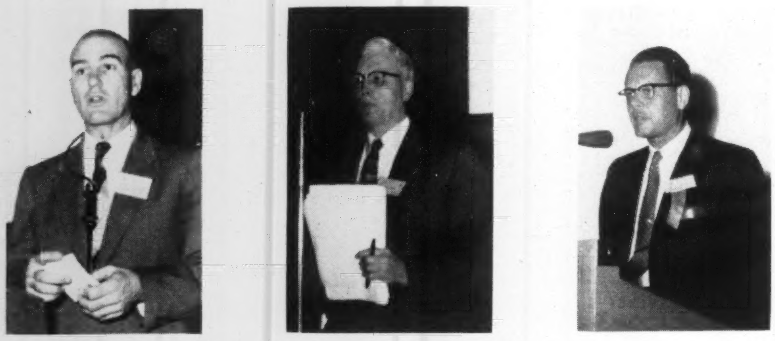
INCOME	OCTOBER 31, 1956	OCTOBER 31, 1955	INCREASE (DECREASE)
DUES	$148,820.13	$140,413.30	$ 8,406.83
ADMISSION FEES	9,741.00	8,712.65	1,028.35
EMBLEMS, PINS, ETC.	961.80	1,558.75	(596.95)
PUBLICATIONS			
JOURNAL Contract	28,916.70	23,500.00	5,416.70
THE GUIDE	187,744.02	163,552.46	24,191.56
TRANSACTIONS	1,704.20	1,358.08	346.12
Books, Reprints, Codes, etc.	5,314.72	4,431.74	882.98
Membership Roll	3,945.96	7,685.50	(3,739.54)
INVESTMENTS	664.27	908.55	(244.28)
FOREIGN EXCHANGE	65.31	166.79	(101.48)
NON-RECURRING	169.90	-0-	169.90
RESEARCH			
Dues	79,491.75	73,967.74	5,524.01
U.S. Navy Research	127.50	1,599.68	(1,472.18)
Contributions — General	22,079.63	24,319.71	(2,240.08)
Contributions — Earmarked	106,217.82	82,934.45	23,283.37
Interest	481.35	502.78	(21.43)
TOTAL INCOME	596,446.06	535,612.18	60,833.88

EXPENSES	OCTOBER 31, 1956	OCTOBER 31, 1955	INCREASE (DECREASE)
COMMITTEES AND CHAPTERS	24,595.87	29,869.95	(5,274.08)
MEETINGS	6,656.99	6,884.10	(227.11)
PUBLICATIONS			
Member Subscriptions to *H.P.A.C.*	3,771.25	20,042.06	(16,270.81)
TRANSACTIONS			
Volume 61	24,889.85	-0-	24,889.85
Volume 60	2,895.96	26,004.03	(23,108.07)
Membership Roll	2,228.24	5,796.67	(3,568.43)
Books, Reprints, Codes, etc.	3,936.29	2,604.57	1,331.72
THE GUIDE	102,767.75	98,031.01	4,736.74
HEADQUARTERS	173,484.59	170,013.83	3,470.76
FUND RAISING	19,375.65	16,936.79	2,438.86
RESEARCH			
Committee Expenses	3,435.14	5,168.06	(1,732.92)
Staff Salaries	107,862.52	100,175.04	7,687.48
Laboratory Expenses	25,598.10	23,791.87	1,806.23
Building Operation and Maintenance	11,915.97	9,804.23	2,111.74
Provision For Building Maintenance Reserve	2,000.00	2,000.00	-0-
U.S. Navy Research	-0-	676.51	(676.51)
Cooperative Research	48,000.00	44,821.70	3,178.30
OTHER DEDUCTIONS	-0-	379.64	(379.64)
TOTAL EXPENSES	563,414.17	563,000.06	414.11
NET CHANGES FOR THE YEAR	$ 33,031.89	($ 27,387.88)	$60,419.77

Journal Section

(Continued from p. 147)

author W. W. Smith, College Station, Tex. Written discussions were made by K. E. Johnson, Kansas City, Mo. and J. G. DeFlon, Whittier, Calif., while D. R. Baker, Kansas City, Mo., spoke from the floor, with Professor Smith closing the discussion period.



Papers at the technical sessions produced much discussion. Shown above are W. W. Smith (left) and Walter A. Grant (right) presenting their papers, while Linn Helander (center) takes part in a discussion.

President James announced that the second paper would be abstracted by one of the authors, B. J. Fluker, College Station, Tex. The paper is entitled Earth as Heat Source and Sink for Heat Pumps, by D. M. Vestal, Jr. and B. J. Fluker (published in the ASHAE Journal section, *Heating, Piping & Air Conditioning*, August 1956, p. 117). Written discussions had been prepared by Merl Baker, Lexington, Ky., J. V. Borry, Minneapolis, Minn., F. R. O'Brien, Birmingham, Ala., and W. L. McGrath, Syracuse, N.Y. A floor discussion was presented by S. F. Gilman, Syracuse, N.Y.

At this time, President James announced the appointment of the Inspectors of Election and the Committee on Resolutions, stating that both these groups would report at later sessions.

The closing paper entitled From '36 to '56: Air Conditioning Comes of Age, (published in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, in 3 parts — Part I in January 1957, p. 191; Part II in February 1957, p. 233; and Part III in March 1957, p. 155) was presented by its author, Walter A. Grant, Syracuse, N. Y., with the use of a series of slides.

Following completion of the presentation of the paper, President James adjourned the session at noon.

Second Session, Tuesday, Feb. 26, 9:30 a.m.

As soon as he had called the session to order in the Waldorf Room at the Conrad Hilton Hotel, 1st Vice Pres. P. B. Gordon, New York, N. Y., announced that Prof. B. H. Jennings, Evanston, Ill., and chairman of the Committee on Research would present the annual report of that committee (printed report in full can be found in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, January 1957, p. 199).

The next order of business was the receipt of the report of the Inspectors of Election.

Chairman Gordon then turned the session over to Professor Jennings in order that the 4 technical papers on the program might be heard.

The first paper entitled Revised Winter Outside Design Temperatures (published in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, November 1956, p. 137) was presented by its author H. C. S. Thom, Washington, D.C. Written discussions were received from D. W. Boyd, Toronto, Ont., Canada, P. R. Achenbach, Washington, D. C., J. B. Graham, Buffalo, N. Y., John Everetts, Jr., Philadelphia, Pa., C. W. Signor, Detroit, Mich., and W. R. Brisken, Bloomfield, N. J. Oral discussions from the floor were made by F. H. Fuller, Wilmington, Del., and by G. S. Campbell, Chattanooga, Tenn. Following the discussion period, Mr. Thom concluded his remarks concerning the paper and the discussions.

Analysis of an Air-Conditioning Thermal Circuit by an Electronic Differential Analyzer was the title of the next paper, with G. V. Parmelee, Dhahran, Saudi Arabia, P. Vance, Cambridge, Mass. and A. N. Cerny, Cleveland, Ohio, as joint authors (published in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, September 1956, p. 117). The paper was presented by title only and there was no discussion.

Introduced by Chairman Jennings, the next author was A. A. Putnam, Columbus, Ohio. He presented the paper by himself and W. R. Dennis also from Columbus, Ohio, and entitled Pulsations in Residential Heating Equipment — Preliminary Results (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, July 1956, p. 131). H. R. Heiple, Sewaren, N. J., W. B. Kirk, Cleveland, Ohio, A. A. Marks,

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Report of Inspectors of Election

BALLOT For Officers for 1957:	TOTAL
President	
P. B. Gordon, New York, N. Y.	2379
First Vice President	
E. R. Queer, University Park, Pa.	2379
Second Vice President	
A. J. Hess, Los Angeles, Calif.	2379
Treasurer	
C. H. Pesterfield, East Lansing, Mich.	2379
Members of Council (*three-year term*)	
W. G. Hole, Montreal, Que., Canada	2378
P. J. Marschall, Chicago, Ill.	2378
W. O. Stewart, Los Angeles, Calif.	2378
P. N. Vinther, Dallas, Tex.	2376
Committee on Research (*three-year term*)	
D. D'Eustachio, Port Allegany, Pa.	2379
E. S. Howarth, New Kensington, Pa.	2377
H. R. Limbacher, Kalamazoo, Mich.	2378
E. F. Snyder, Minneapolis, Minn.	2377
J. I. Trimble, Columbus, Ohio	2377
Committee on Research (*one-year term*)	
P. H. Yeomans, Philadelphia, Pa.	2378
Total Ballots Received	2461
Total Legal Ballots	2379
Invalid Ballots	82

Scattering votes: Members of Council 3 and Committee on Research 9.

Respectfully submitted,

R. J. Salinger, *Chairman*
Chicago, Ill.

F. W. Brundage
Kalamazoo, Mich.

L. C. Plaehn
Milwaukee, Wis.

Philadelphia, Pa. and Bela Karlowitz, Pittsburgh, Pa. had prepared written discussions while C. J. Sanders, Chicago, Ill., presented a floor discussion, after which Mr. Putnam closed the discussion period.

K. T. Whitby was introduced to present the fourth paper on the program. This paper, The Dust Spot Method for Evaluating Air Cleaners, by Dr. Whitby, A. B. Algren and R. C. Jordan, all of Minneapolis, Minn., was published in the November 1956 issue of the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, beginning on p. 151. A written discussion was received from W. C. L. Hemeon, Pittsburgh, Pa., while R. D. Rivers, Louisville, Ky., offered remarks from the floor.

Following the close of the discussion period by Dr. Whitby, Chairman Jennings turned the session back to 1st Vice President Gordon who declared the session adjourned at 12:10 p.m.

Third Session, Tuesday, Feb. 26, 9:30 a.m.

This session which took the form of a Symposium on Dehumidification was called to order by Treas. R. A. Sherman, Columbus, Ohio, in the Grand Ballroom, Conrad Hilton Hotel. He at once introduced John Everetts, Jr., Philadelphia, Pa., to act as Moderator.

Mr. Everetts outlined the nature of the program which consisted of 5 papers prepared by speakers selected to discuss major phases of the subject, as follows: I — *Dehumidification by Mechanical Refrigeration* — W. E. Ellis, Cincinnati, Ohio; II — *Dehumidification by Solid Sorbents* — W. L. Ross, Johnstown, Pa.; III — *Dehumidification by Liquid Sorbents* — E. W. Gifford, Milwaukee, Wis.; IV — *Economics of Dehumidified Storage* — G. W. Higgs, Jr., Washington, D. C.; and V — *Typical Dehumidification Problems and Their Solution* — E. R. Queer, University Park, Pa.

Successively as called on by Mr. Everetts, each author presented his prepared paper and the session was then thrown open for discussion. A written discussion had been prepared by G. W. Adolphson, Puget Sound Naval Shipyard, and the subject was orally discussed by H. E. Parker, Quincy, Mass., G. L. Simpson, Pittsburgh, Pa., G. C. F. Asker, Falls Church, Va., W. M. Viessman, Baltimore, Md., H. W. Lyons, Philadelphia, Pa., O. D. Colvin, New York, N. Y. and T. H. Urdahl, Washington, D. C. The questions raised and points discussed by these discussers were referred by Moderator Everetts to the several speakers who further discussed and commented on them.

Since these symposium papers and the discussions are of an informal nature, it is not expected that they will be printed in full in Transactions. However, the text of 2 of these papers, those by Dr. Ross and by Professor Queer, are printed in full in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, March 1957, p. 161. Text of the remaining 3, those by Mr. Ellis, Mr. Gifford and Mr. Higgs, are published in the April 1957 issue of the Journal Section, beginning on p. 152.

It is planned to make available soon, the text of all 5 of the papers presented at this Symposium in the form of a separately printed bulletin.

Following the close of the discussion period, Moderator Everetts turned the session over to Treasurer Sherman who adjourned it at 12:10 p.m.

Fourth Session, Wednesday, Feb. 27, 9:30 a.m.

After opening the session in the Waldorf Room of the Conrad Hilton Hotel, First Vice President Gordon at once introduced L. F. Schutrum, Cleveland, Ohio. Mr. Schutrum presented the paper Cold Wall Effects in a Ceiling-Panel-Heated Room, by L. F. Schutrum and T. C. Min (pub-

The Head Table **Annual Banquet**

Shown in center photo at right *(l. to r.)* Prof. M. K. Fahnestock, Mrs. P. B. Gordon, Dr. Arthur Cutts Willard, John W. James, Dr. Preston A. Bradley, W. A. Kuechenberg and P. B. Gordon.
Shown in the photograph left below are Mrs. M. K. Fahnestock, C. M. Ashley,

American Society of Heating and Air-Conditioning Engineers

Mrs. H. G. Gragg, R. A. Sherman, Mrs. A. J. Hess, Prof. E. R. Queer, Miss Betsy Ross.
Shown in the photograph below on the right are Mrs. John W. James, John E. Haines, Mrs. E. R. Queer, A. J. Hess, Mrs. John E. Haines, Prof. C. H. Pesterfield, Mrs. P. J. Marschall.

lished in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, August 1956, p. 125). Written discussions were presented by W. P. Chapman, Milwaukee, Wis., R. J. Mindak, Chicago, Ill., P. E. McNall, Minneapolis, Minn., and by F. J. Linsenmeyer, Detroit, Mich., Mr. Schutrum closed the discussion.

Prof. Maurice K. Fahnestock receives the F. Paul Anderson Medal for 1956 from President James. The citation read "Engineer, educator, researcher, and author, whose early recognition of the importance of man's physiologic response to atmospheric environment, and whose encouragement of cooperative research in the fields of human comfort, health, and efficiency by the engineering and medical professions have rendered a service of distinct benefit to the general public."

The second paper at the session was entitled Performance of Covered Hot Water Floor Panels, Part II - Room Conditions, by E. L. Sartain, Racine, Wis., and W. S. Harris, Urbana, Ill. (published in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, November 1956, p. 143).

First Vice President Gordon announced that the paper would be presented by Mr. Sartain. Following this, a written discussion from R. B. Rice, Raleigh, N. C., was heard, and T. C. Min, Cleveland, Ohio, presented a discussion written by himself and Mr. Schutrum. E. L. Perrine, Evanston, Ill., discussed the paper orally. Mr. Sartain then concluded the discussion period.

The last paper programmed for the session was presented by Mr. Schutrum, who is on the staff of the Society Research Laboratory, although the actual preparation was accomplished by a sub-committee of the Technical Advisory Committee on Panel Heating and Cooling and various members of the Laboratory Staff. The paper appears under the title, Thermal Design of Warm Water Concrete Floor Panels, in the October 1956 issue of the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, beginning on p. 125.

Chairman Gordon announced that written discussions had been prepared by E. L. Sartain and by Mr. Linsenmeyer (Detroit) and they were read. Additionally, oral discussions were presented by J. L. Bradfield, Indianapolis, Ind., and by George Applegate, Jr., Trowbridge, England.

Following completion of the discussions, Mr. Schutrum closed the discussion and Chairman Gordon adjourned the session at 11:45 a.m.

Fifth Session, Wednesday, Feb. 27, 9:30 a.m.

Second Vice Pres. E. R. Queer, University Park, Pa., opened the fifth session in the Grand Ballroom of the Conrad Hilton Hotel. This session took the form of a Symposium on the general subject of Industrial Ventilation. Professor Queer at once introduced C. H. Pesterfield, East Lansing, Mich., who acted as moderator at the session.

Five papers had been arranged covering various topics as follows: I — *Control of the Industrial Environment* — P. J. Marschall, Chicago, Ill.; II — *Dust Particle Inertia and Various Consequences* — W. C. L. Hemeon, Pittsburgh, Pa.; III — *Contaminant Control* — K. E. Robinson, Detroit, Mich.; IV — *Summer-Winter Comfort Ventilation for Industry* — B. R. Small, Pittsburgh, Pa.; V — *Cleaning of Industrial Effluents* — J. M. Kane, Louisville, Ky.

Moderator Pesterfield called on these authors successively and they presented their prepared material after which the moderator indicated that questions from the floor could be directed to these various authors.

Because of the nature of these papers and of the discussions presented in connection with them, it is not expected that they will appear in the Transactions. However, two of these papers, namely, paper II and paper IV are published in the February 1957 issue of the ASHAE Journal Section, *Heating, Piping & Air Conditioning*. The paper II entitled Dust Particle Inertia and Various Consequences by Mr. Hemeon begins on p. 247 and the paper IV, Summer-Winter Comfort Ventilation for Industry, by Mr. Small, begins on p. 241. Paper V on the subject of Cleaning of Industrial Effluents, prepared by Mr. Kane, appears in the April 1957 Journal Section, *Heating, Piping & Air Conditioning*, p. 166. It is expected that papers I and III will be published in an early issue of the Journal Section. It is also planned that all 5 of the papers will be assembled in a separately printed bulletin and made available. Announcement concerning this will be made.

During the course of the discussion period which followed, oral discussions were presented by V. J. Jamal, Niagara Falls, N. Y., J. J. Aeberly, Chicago, Ill., Warren Viessman, Baltimore, Md., J. H. Clarke, Chicago, Ill., I. S. Dane, Boston, Mass., H. W. Reinken, Detroit, Mich., W. A. Danielson, Memphis, Tenn., and K. T. Whitby, Minneapolis, Minn. Following the completion of the discussion period, Moderator Pesterfield turned the meeting back to Second Vice President Queer who adjourned the session at 12:00 p.m.

Sixth Session, Thursday, Feb. 28, 9:30 a.m.

Meeting in the Waldorf Room of the Conrad Hilton Hotel, Pres. John W. James, Chicago, Ill., called the sixth session to order and introduced Linn Helander, Manhattan, Kans., who presented the first paper entitled

Outlet Characteristics That Affect the Downthrow of Heated Air Jets, by Linn Helander, Shee-Mang Yen and Wilson Tripp (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, December 1956, p. 109).

Written discussions were presented by L. R. Phillips, Hartford, Conn. and H. B. Nottage, Encino, Calif. W. O. Huebner, New York, N. Y. and J. J. Aeberly, Chicago, Ill., discussed the paper orally after which Professor Helander ended the discussion by commenting on the discussions presented.

The second paper, Air Flow in Free Convection Over Heated Bodies, by T. F. Hatch and D. Barron-Oronzco, both from Pittsburgh, Pa., was presented by Professor Hatch (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, October 1956, p. 117).

Written discussions were presented by W. C. L. Hemeon, Pittsburgh, Pa., P. J. Marschall, Chicago, Ill., G. M. Hama, Detroit, Mich., and Benjamin Feiner, New York, N. Y.

Oral discussions by Linn Helander, Manhattan, Kans., and R. C. Last, Melbourne, Australia, followed, and Professor Hatch then closed the discussion period.

The last paper, entitled Radioactive Process Ventilation, by S. H. Glassmire and J. P. Wahlen (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, December 1956, p. 117) was presented by S. H. Glassmire, Los Alamos, N. M.

Written discussions were presented by P. M. Engle, Syracuse, N. Y. and C. R. Wherritt, Los Alamos, N. M. From the floor, W. W. Hackney, Dayton, Ohio, P. B. Gordon, New York, N. Y. and Leonard D'Ooge, Sacramento, Calif., presented oral discussions and Mr. Glassmire then gave his closing remarks.

At this time, since the meeting was honored by the presence of the President of the *Institution of Heating and Ventilating Engineers* of England, J. Clifford Byles, President James invited him to address the session. In reply, Mr. Byles spoke briefly concerning his impressions of his trip and indicated that the hospitality and generosity that he received were outstanding. He also indicated that the research activities of the Society and the air-conditioning industry had impressed him greatly. He also outlined current English activities in this field, mentioning the Building Research Station at Wattford, England, and the Fuel Research Station at Greenwich. He pointed out that a research association is presently being established to be governed entirely by the heating industry itself, and that a substantial sum of money is being raised in connection with it. He had hopes, therefore, that the English research activities in this field would shortly be increased in volume and he hoped that they would be conducted on a high standard of perfection.

Pres. John W. James receives the Past President's Award from Past Pres. John E. Haines

AMERICAN SOCIETY
HEA CONDITIONING
EERS

The student branch from Purdue University attended in a group

The next order of business was the Report of the Resolutions Committee and President James called on A. O. Roche, Jr., Indianapolis, Ind., who read the report of that committee which appears herewith.

Resolutions

WHEREAS, the 63rd Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS and the 13th International Heating and Air-Conditioning Exposition and now drawing to a close, and

WHEREAS, this meeting was held in Chicago where cooperation with the weatherman, after early signs of spring, finally made good its renowned claim to being the Windy City, and

WHEREAS, the Illinois Chapter and the Committee on Arrangements under the direction of Pete Marschall, general chairman, have ably provided for our comforts and entertainment and relaxation, and

WHEREAS, the arts and sciences of our profession have been advanced by the excellent choice of material for our Technical Sessions under the direction of the officers and staff of our Society, and

WHEREAS, the 13th International Heating and Air-Conditioning Exposition has broken all records for quality of exhibits, size and attendance; therefore

BE IT RESOLVED, that our appreciation and sincere thanks be extended:

To the Illinois Chapter, its officers and committees who have made this meeting possible,

To Pete Marschall, general chairman, Harry Gragg, vice-chairman and Illinois Chapter President, and to Honorary Chairmen, H. M. Hart, S. R. Lewis and Dr. A. C. Willard,

To Mrs. Harry Gragg and the ladies of her committee who so outstandingly provided for the welfare and entertainment of our visiting Ladies,

To Dr. Richard Heflebower for an interesting preview of things to come,

To the authors and discussers of the technical papers and symposiums for their educational contributions,

To the Chicago Hotels for providing for our needs and comforts, To Bill Kuechenberg who so ably presided at the Annual Banquet,

To Dr. Preston A. Bradley, who in 4 short years has been promoted from our luncheon speaker to our banquet speaker, for his inspirational address on *Facing the Future*.

To Maurice K. Fahnestock for his many years of service and creative contributions to our Society and the profession, who has been presented the F. Paul Anderson Award in recognition of these achievements.

To E. K. Stevens and the International Exposition Co. for the excellent presentation of the products of our industry.

To Paul M. Chung for his contributions to the arts for which he was chosen the first recipient of the ASHAE-Homer Addams Award.

To the members of our Society who have been honored with the new membership grade of Fellow. These distinguished gentlemen are: Walter L. Fleisher, L. N. Hunter, J. Donald Kroeker, C. S. Leopold, Samuel R. Lewis.

To President John W. James who this Resolutions Committee feels has been outstanding in adding dignity and stature to this office throughout the world, and

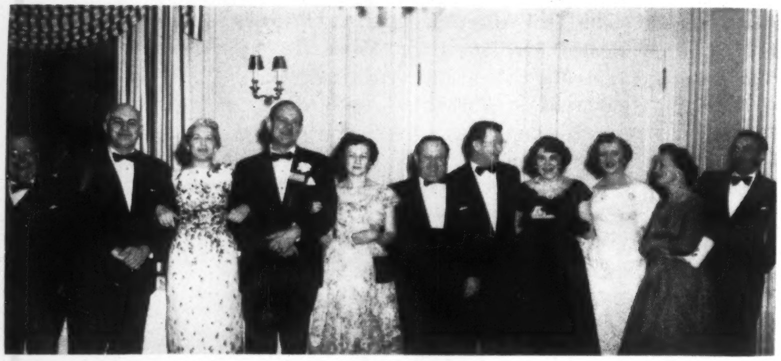
To the other Officers, Committees, Staff and all others who have so generously given of their time and efforts which have resulted in this successful meeting.

Respectfully submitted
RESOLUTIONS COMMITTEE
A. O. Roche, Jr., *Chairman*
Indianapolis, Ind.
A. W. Edwards, Cincinnati, Ohio
J. W. May, Louisville, Ky.

Following adoption of the resolutions and since there was no unfinished business or new business to come before the session, President James adjourned the meeting.

Life Members Meet

For the second time, many of the life members who were in attendance at the meeting met informally for a dutch treat luncheon at the Conrad Hilton Hotel on Tuesday afternoon. At this meeting, 27 life members were in attendance as follows: E. K. Campbell, Kansas City, Mo.; Howard E. Sproull, Cincinnati, Ohio; Samuel R. Lewis, Chicago, Ill.; Edwin A. Jones, Cedar Rapids, Ia.; Richard F. Connell, Detroit, Mich.; H. Leigh Whitelaw, New York, N.Y.; William E. Gray, Camp Detrick, Md.; Milton S. Smith, New York, N.Y.; Alfred E. Stacey, Jr., Syracuse, N.Y.; Eugene P. Bradley, St. Louis, Mo.; Irving C. Jennings, South Norwalk, Conn.; Ralph B. Stanger, Pittsburgh, Pa.; Robert P. Schoenijahn, Wilmington, Del.; Roswell Farnham, Buffalo, N.Y.; Carl H. Flink, New York, N.Y.; Lee P. Hynes, Haddonfield, N.J.; H. S. Wheller, Linden, N.J.; Irvin H. Geiger, Harrisburg, Pa.; Charles R. McConner, Kalamazoo, Mich.; John J. Yager, Buffalo, N.Y.; Milton S. Wunderlich, Minneapolis, Minn.; James J. Hayes, Chicago, Ill.; A. C. Buensod, New York, N.Y.; Edmund P. Heckel, Chicago, Ill.; Wm. G. Boales, Sr., Detroit, Mich.; Arthur C. Willard, Urbana, Ill.; R. J. Tenkonohy, LaPorte, Ind.



Receiving line at the President's Reception. (l. to r.) Dr. Preston A. Bradley, P. B. Gordon, Mrs. John W. James, John E. Haines, Mrs. E. R. Queer, A. J. Hess, C. H. Pesterfield, Mrs. John E. Haines, Mrs. P. J. Marschall, Mrs. W. A. Kuechenberg, E. K. Stevens.

Since the idea of some kind of organization among the life members had been given consideration at earlier gatherings, this subject proved of interest at the luncheon meeting. As a result, it was decided that the life members would recognize that the purpose of any such organization among them would be largely to promote and to continue acquaintances among the life members who are in attendance at the Annual Meetings, and that the group would continue to follow the practice of having a dutch treat luncheon at each meeting.

Ralph B. Stanger was selected as chairman for this luncheon at the Pittsburgh Meeting in January 1958. Many possible activities into which the group might enter were discussed without formal action being taken.

Program for the Ladies

For the first 3 days of the Meeting, a Hospitality and Reception Headquarters was maintained in the hotel through the courtesy of the *Heating, Piping and Air Conditioning Contractors Chicago Association* and the *Chicago Ventilating and Air Conditioning Contractors Association*. This headquarters was much used throughout the Meeting and in connection with the Ladies' Program.

On Monday there was a Ladies' Talent and Tea at the Sheraton-Blackstone Hotel, while on Wednesday there was a Luncheon and Entertainment at midday at the South Shore Country Club.

Special Events

At a Welcome Luncheon held on Monday noon, Dr. Richard Heflebower of Northwestern University held the close attention of his audience with his observations on *Revolutions in Our Times — What Our Lives Will Be Like in the Next 10 Years*.

C. M. Burnam, Jr., Chicago, Ill., presided as toastmaster at the Luncheon and presented the speaker along with five members who were made Fellows, and Paul K. Addams, who presented the ASHAE-Homer Addams Award to Paul M. Chung.

On Monday evening there was a Get-Together Party in the Grand Ballroom at the hotel with professional entertainment and dancing.

At the Annual Banquet held on Wednesday evening, presided over by W. A. Kuechenberg, Chicago, Ill., the speaker was Dr. Preston A. Bradley, Pastor of Peoples Church of Chicago, with his subject *Facing the Future*. At the Banquet also, the newly elected Officers and members of the Council were inducted into office; also the Past President's Award and the Award of the F. Paul Anderson Medal for 1956 to Prof. Maurice K. Fahnestock were conferred.

Acknowledgement is made to W. M. Wallace, II, Durham, N.C., who made available many photographs taken during the Meeting, some of which are reproduced here.

Text of Two Papers from a . . . .

Symposium on Industrial Ventilation

C. H. Pesterfield, Moderator

Prof. of Mech. Engrg., Michigan State University, East Lansing, Mich.

The 5th session of the 63rd Annual Meeting of ASHAE at Chicago on February 27, 1957, was programmed as a Symposium on Industrial Ventilation. Papers on assigned phases of this general subject were prepared by 5 leading Society members. Each read his paper at the session and a discussion period followed. The Symposium members were (I) P. J. Marschall, (II) W. C. L. Hemeon, (III) K. E. Robinson, (IV) B. R. Small, and (V) J. M. Kane.

Presented here is the full text (without discussion) of papers (I) and (III). The full text of papers (II) and (IV) can be found in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, February 1957, beginning on p. 241. Paper (V), in full, can be found in the April 1957 issue, p. 166.

I — Control of the Industrial Environment

P. J. MARSCHALL—manager of engineering, Abbott Laboratories, North Chicago, Ill. Graduated Armour Institute of Technology, B.S. in electrical engineering, 1924. *Aerologist*, Chicago, 1925-34; Kroeschell Engineering Co., Chicago, 1934-42; Abbott Laboratories, since 1942. Served on numerous *ASHAE* committees: President, Illinois Chapter, 1950. Presently chairman TAC on Industrial Environment. Also general chairman, Committee on Arrangements, 63rd Annual Meeting. Member of ASHAE.

I am pleased to have the privilege and pleasure of keynoting this symposium. The speakers who will follow are members of the ASHAE Research Technical Advisory Committee on the Industrial Environment. They, and other members of this committee, have been very generous in giving of both their time and knowledge to provide useful data in The Guide to enable engineers to improve the industrial environment for both the worker and the manufacturing process. Control of the industrial environment is the control of the industrial atmosphere to meet the requirements of health, comfort, safety, and production; and the abatement of atmospheric nuisances, and the recovery of air-borne waste.

The Technical Advisory Committee on the Industrial Environment, made up of representatives of the consulting field, the equipment manufacturer, the industrial hygienist, and the industrial user, was formed for the purpose of developing the practical information necessary to accomplish this objective.

Scope of TAC on Industrial Environment

The scope is extremely broad, and to facilitate the work of the committee 6 sub-committees have been appointed as follows: (a) Supply Air (industrial), (b) Process Aerodynamics, (c) Air Contaminants (indoor and outdoor), (d) Temperature Extremes, (e) Exhaust Air Cleaning (air pollution control), and (f) Industrial Exhaust Systems. Briefly, the scope of these sub-committees is as follows.

The scope of the Sub-Committee on Supply Air includes recommendations for the design of systems for industrial air conditioning, industrial ventilation, and make-up air for systems exhausting fumes, gases, and vapors.

The Sub-Committee on Process Aerodynamics is currently interested in a Society-sponsored project under way at the University of Pittsburgh. Under the direction of Theodore F. Hatch, experimental data is being collected on the *Design of Local Exhaust Ventilation for Hot Industrial Processes.* In the study of this problem, Professor Hatch is using hot bodies of various sizes operating with different degrees of heat to establish relationship between the quantity of air set in motion, the distance from the hood, quantity of heat released (distinguishing between the radiant and convective heat), and the geometry of the body. A paper on the results of the work to date was published in the ASHAE Journal Section, *Heating, Piping & Air Conditioning*, October, 1956. It is to be presented at the technical session tomorrow morning.

The Sub-Committee on Air Contaminants is responsible for supplying information on the toxic characteristics of gaseous matter in the atmosphere. This committee compiles data from various sources for publication in The Guide. Most of the information published in The Guide on maximum allowable concentration of gases and vapors is obtained from the *American Conference of Governmental Industrial Hygienists.* In many instances, however, the maximum allowable concentration is not a fixed limit, but is subject to revision with the development of new information based on more complete environmental and medical studies.

The Sub-Committee on Industrial Exhaust Systems is concerned with recommendations for hood design, capture velocities, and design of systems to collect and remove fumes, mists, vapors, and gases.

The Sub-Committee on Exhaust Air Cleaning is concerned with the principles involved in the operation of industrial air and gas cleaners. This sub-committee prepared 3 new tables for The Guide 1954 giving the important characteristics of the inertial separators, wet collectors, and fabric filters. Incidentally, the committee members are interested in receiving comments on the usefulness of this type of table which obviously cannot be too specific.

The Sub-Committee on Temperature Extremes is concerned with the establishment of criteria which will help the design engineer to provide an environment which will result in tolerable working conditions rather than comfort conditions.

Industrial Environment and the Worker

Now let us turn attention to the subject of how the industrial environment affects the comfort, health, and productivity of the worker. The need for better environmental conditions for both worker and process is greater today than ever before, and the need will be even greater in the years to come. All are familiar with the upward trend in hourly wage rates. It is well known too that to have a balanced economy, this increase in wages and salaries can only be justified by increased productivity. Increased productivity through technological improvement is one method, but production can also be increased through better environmental conditions for the worker. It is generally recognized that factory productivity increases if the detrimental aspects of a work situation are removed. A work situation which causes fatigue, irritability, and discomfort can indirectly cause a loss in productivity. Extremes in heat, cold, humidity, fumes, dust, radiation, and similar environmental factors can reduce a man's efficiency because some of his body energy is lost in adjusting to the extremes of the environment.

Let us not overlook the fact that the control of temperature and relative humidity not only provides better conditions for the worker, but may also result in products of more uniform quality.

A survey of more than 1000 metalworking plants, published under the title *How to Beat the Heat,* recently came to the writer's attention. This survey reports that in 60 percent of this country the hot weather problem is rated serious, or mildly serious, for metalworking plants. Hot weather brings with it problems of keeping the office and plant efficiency high, labor grievances and worker irritation low. The metalworking industry is not alone in this regard, as there are many industries vulnerable to the same problems because of heat generating processes.

One may justifiably ask the question *How much does the efficiency of the worker increase through better environmental conditions?* Unfortunately, the Society does not have the answer to this question. Perhaps a research study should be initiated to determine the worker's efficiency under different conditions of temperature and humidity.

What is known, however, is the opinion of the management of firms who have provided a better environment. Here's a quote from an officer of a die and machine company which air conditioned its shop. This officer states: *We have absolutely none of the usual hot weather absenteeism since we air conditioned our shop. The men like the air conditioning so well that the day shift lines up outside the door at 6:30 a.m. to start work at 7:00 a.m., and we have difficulty keeping the night shift out when they come to work in the afternoon.* Before the air conditioning was installed in this plant sometimes 35 percent of the men would be absent in very warm weather.

In the industry with which the speaker is associated, air conditioning is required in many areas because of the product or process. However, air conditioning has been provided in many work areas where this was not a requirement.

Generally it is our belief that air conditioning is a sound investment. The exceptions to this concept are areas having high heat gain and low density of population, and warehouse areas with low density population.

The owning and operating costs of many of these air-conditioning systems is less than $60 per year per employee benefited. This is substantially less than cost of the average wage increases.

It is not always practical from the standpoint of economics to provide air conditioning. Considerable improvement in the environment may also be accomplished with well designed ventilating systems. Spot cooling, for example, has been adopted in many instances, and the results have been very satisfactory, particularly where provision has been made for the individuals to adjust the air flow to suit their needs.

Now in this area just covered, further information is needed on comfort conditions for people whose work rate results in heat production up to say 1200 Btu per hour, which is 3 times the heat production of a person in a sedentary occupation. Very shortly work will be started in the environmental room in our Society Laboratory in Cleveland to determine comfort conditions for these higher rates of heat production.

More information is also needed on the physiological effects due to temperature and velocity of the air striking exposed surfaces of the body in order to better design a system which will provide relief in industrial areas without the detrimental effects which may result with an improper design of a spot cooling system.

Control of Contaminants

Now let's take a look at another field which is equally important in the control of the industrial environment, and that is the control of fumes, gases, vapors, and dust.

Manufacturing processes are frequently the source of contaminants and it is extremely important that they be controlled to avoid damage to health and property and to avoid becoming a nuisance to the neighboring community. The latter statement, be it noted, can be quite a provocative issue between industry and its neighbors.

The problems here are two-fold: (1) the provision of a safe environment (or non-irritable) for the workers, and (2) the need for cleaning up the effluents discharged outdoors by means of a suitable industrial air or gas cleaner. Perhaps a change in the process would obviate, or materially reduce the need for a system to remove the obnoxious and/or toxic contaminants. If this is not practical, the next approach is to do an effective job of economically collecting and treating the effluent.

Tables in The Guide give the maximum allowable concentrations of gases and vapors, and threshold limits for toxic dust and fumes. These concentrations, or threshold limits, are based on the worker being exposed to them for the normal work week. More information is needed where the exposures are for longer periods. More information is also needed concerning the effects of these contaminants on infants, children, aged people, and the ill.

Cleaning up the effluent discharge outdoors has already been mentioned. For a time many industries avoided this problem by setting up their plants in areas remote from any community. Today many of these plants are no longer isolated and have, or may have, to do something about the control of the effluent they are discharging to the outdoors. The big question is how clean must this effluent be. Surely most industries would spend whatever amount is necessary to remove all toxic substances in their effluents.

Industry does, however, have another problem, and that is what to do about odors and dusts which may not be toxic but may be classed by the community as being objectionable. The problem of air pollution is certainly one in which our Society should take a more active part.

It is very important that the research necessary to establish basic design criteria should be accomplished within a reasonable period of time. Health officials in cities and states have considerable pressure on them to put more stringent codes into effect and then to enforce them. These codes could, because of the lack of adequate design criteria, be too rigid and compliance might at times be difficult and uneconomical.

Codes, in the speaker's opinion, should be specific only in regard to the end results. The means by which the desired results are attained should be left to the ingenuity of the professions involved.

Hot Environments

Then there is the so-called *hot environment* within manufacturing areas where the problem is to provide tolerable conditions rather than comfort conditions. Very little information is available at temperature extremes on the effects of air motion, humidity, and radiation at different work rates on people of different ages and sexes. Development of a method for measuring the stress in human beings, and possibly a method of measuring human work efficiency under various conditions, is urgently needed.

Stress factors such as temperature, humidity, skin temperature, rectal temperature, and pulse rate will necessarily have to be established through research conducted by qualified doctors and physiologists.

From the preceding remarks it must be very apparent that there is a need for a considerable amount of research to develop the design criteria to help the engineer solve the broad range of problems encountered in the industrial environment.

What to Do

In conclusion, it can be pointed out that there are a couple of ways in which you can participate in this program: (1) you can help validate design criteria by reporting to the Committee on Research the results of field tests of the performance of industrial air conditioning, ventilation, and exhaust systems (as a matter of fact, subjective tests, *i.e.* the worker's response concerning his degree of comfort, are a very important evaluation of the performance of an installation); (2) you can be of great service to your Society by encouraging your company to contribute to the financial support of our research program. This applies not only to those who benefit directly from the sale and installation of equipment and materials for the control of the industrial environment, but may also include the users who will also benefit through better and more economical installations with increased productivity.

III — Contaminant Control

Ever since man objected to airborne material, he has tried to control it by some form of ventilation. Like the art of healing, which used bloodletting as a cure-all for centuries, ventilation survived on false knowledge. In spite of the advancement in the industrial world, it was only 25 years ago that DallaValle[1] appeared before a meeting of this Society and presented what has become the basic airflow design data for local exhaust hoods. In spite of this information, an unbelievably large number of people involved in the science of ventilation still are trying to control contaminants by *bloodletting*, or to be more specific by using high velocity airflow into a small hood, completely ignoring air volume, hood design, location and/or assuming that inasmuch as air can be blown a considerable distance that it can be drawn a long distance into a hood, thereby controlling an operation many diameters away.

K. E. ROBINSON—ventilation engineer, Industrial Hygiene Dept., Research Staff, General Motors Corp., since 1953. Educated at Michigan State University. 1943-53, ventilation engineer with Industrial Hygiene Dept., State of Michigan. Active in design and operation of heating and ventilating plants since 1935. Member of ASHAE.

The theory of airflow into hoods as developed by DallaValle is based on the supposition that if there could be a point source of suction, air would flow into this point at equal velocities from all directions and the equal velocity lines would, if projected, give perfect spheres (Fig. 1).

The nearest practical installation of a point source of suction is the open pipe. As may be observed (Fig. 2), air flows into this open pipe from all areas not occupied by the pipe itself. Of particular interest to the man designing hoods, where definite control velocity must be maintained a given distance from the hood, is the rapid reduction of the velocity a short distance from the end of the duct work. As can be seen, one diameter out from the opening less than 10 percent of the velocity at the pipe opening will be maintained. DallaValle expressed this with a formula

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[1] Velocity Characteristics of Hoods under Suction, by J. M. DallaValle (ASHVE TRANSACTIONS, Vol. 38, 1932, p. 387).

$$Q = V\,(10\,X^2 + A)$$

when

Q = quantity of air exhausted.
V = control velocity desired in feet per minute.
X = distance between the hood and the point where control velocity must be maintained.
A = the area of the hood in square feet.

Obviously if a given control velocity must be maintained in front of the hood, the efficiency can be improved if some way can be devised to eliminate air being drawn from in back of the hood opening, thereby increasing the flow of air over the desired location. Otherwise, a greater volume of air will be required in order to increase the velocity in front of the hood. The simplest way of doing this is to extend a baffle outwardly at right angles from the end of the duct. As shown in Fig. 3, the velocity contours are pushed outward when more of the air is from in front of the duct opening. There would have to be an increase of at least 20 percent in the volume of air handled through the open duct to provide the same velocity contours as is furnished by the addition of the baffle. Attention is called to the velocity contour lines one diameter from the face opening as they are considerably above 10 percent of the face velocity. Dr. Brandt's report to the Society in 1946 suggested that the easiest way to handle this reduction would be to use the original formula and then to decrease the quantity of air by the percent of savings offered by the baffle.

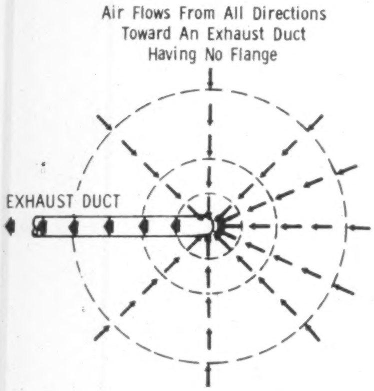


Fig. 1 — Spherical nature of airflow into an unobstructed exhaust hood

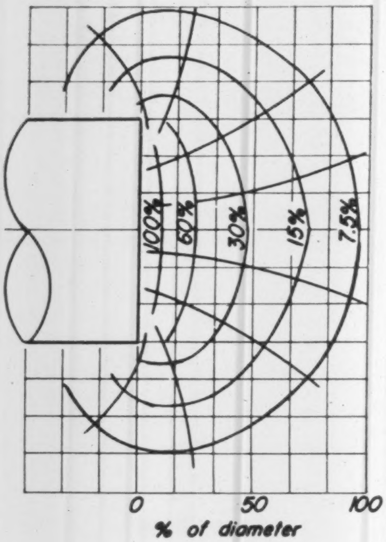


Fig. 2 — *(left)* With an open end suction pipe air flows toward the pipe from all areas not occupied by the pipe itself; at one diameter out from the opening less than 10 percent of velocity at the pipe opening is maintained

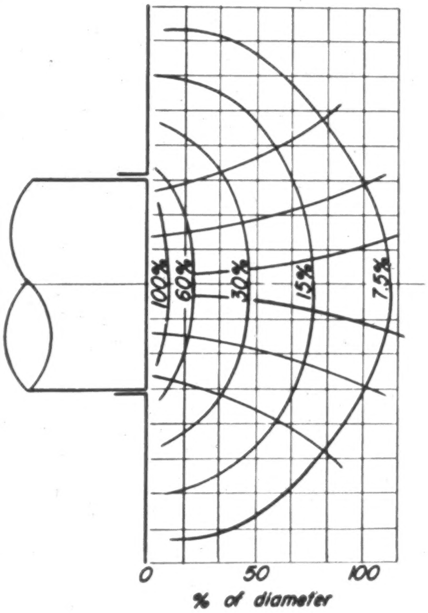


Fig. 3 — *(right)* Airflow contours when the open pipe end is baffled externally at right angles. Velocity contours are pushed outward; at one diameter out from the opening considerably more than 10 percent of the velocity at the pipe opening is maintained

The airflow into all types of hoods is determined using the concepts as just outlined. It is not thought necessary to cover all types at this symposium.

This concept can be utilized not only with local exhaust hoods, but also with so-called general ventilation systems. There is a mistaken idea that all that must be done to control an area is to install a fan in the wall or ceiling to exhaust air from the space. From the discussion of open duct work and also the benefit of baffles, it becomes apparent that a fan mounted in the wall or ceiling draws air from all directions in front of the fan and that the velocity contours extend only a short distance of perhaps 1 or 1½ diameters outward from the fan itself. Therefore, air should not be expected to flow directly into this fan from an operation a considerable distance away. Often the air actually flows along the wall or the under part of the ceiling to the fan. If the air to be exhausted is at a considerably different temperature or density from that directly in front of the fan, it may well be that this barrier of heavier air at the fan cannot be broken and the operation will not be controlled. Under these conditions heat may be given off from an operation 20 or 30 ft below such an exhaust fan and smoke tests will show that the heat does not find its way into the fan at all. If the fan opening is considered as a hood it can often be relocated so more benefits can be obtained. When it is mounted into the wall, the sphere is reduced by half. However, if it is mounted at the intersection of the wall and ceiling, the open area is only a quarter of a sphere. If it were at the intersection of the 2 walls and ceiling, the area is only one-eighth the original sphere. Under such conditions the airflow pattern will be extended considerably and the air being handled will be much more efficient in controlling the contaminant.

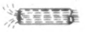
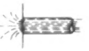
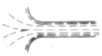
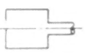
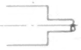
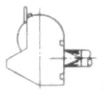
TYPE OF OPENING	DESCRIPTION	ENTRY COEFF., C_e	LOSS IN % OF VELOCITY HEAD, h_e
	PLAIN DUCT END	0.72	93
	FLANGED DUCT END	0.82	49
	WELL ROUNDED ENTRY	0.98	4
	ORIFICE PLUS FLANGED DUCT	0.49	230
	DIRECT BRANCH BOOTH	0.82	49
	STANDARD GRINDER HOOD	0.78	65

Fig. 4 — Air entry loss coefficient for various typical hood shapes

Another item that should not be overlooked is the entrance loss of the hood. Although it is apparently often neglected, air has weight and as we know from driving automobiles it is easier to take weight around a big sweeping curve than a no radius right angle turn. In the designing of hoods, it is most desirable that every effort be made to streamline the openings so that air can get into the hood and duct at the desired velocity, with the minimum expenditure of energy. Fig. 4 shows a series of hoods and the amount of energy required to cause air to flow into them. If a duct velocity of 4,000 fpm is assumed, which corresponds to a velocity pressure of 1 in. water gage, the loss through each hood can be easily determined. The plain duct end causes much of the air to turn 180 deg which it cannot do without pushing over into the center of the duct. When this happens, less of the duct area is used and greater velocity must be obtained by the air, resulting in a high entrance loss. If the plain duct end, the flanged duct end, and the well rounded entry, which is a nearly perfect opening, are compared, it can easily be determined that there is a definite relationship between the effectiveness of the hood and the entrance loss. Detailed description of entry loss can be found in a paper[2] published in 1946.

Another look at DallaValle's formula, $Q = V\ (10\ X^2 + A)$ shows that quantities of air are used without any consideration of the hood face velocity. As was stated earlier, many people mistakenly believe that a high slot velocity will automatically give control. Actually if the same volume of air is maintained and the velocity doubled by decreasing the hood opening 50 percent, the velocity contours 2 diameters in front of the small hood will be less than those one diameter in front of the large hood. Not only is the high velocity hood less effective but, as the velocity pressure increases by the square, the entrance loss may be too high to function properly unless the available suction is increased for the entire system to which this hood is attached. Usually, slot velocities are decided on the basis of what velocity is required to give distribution over the entire face of the hood. With well designed hoods, 2000-2500 ft per min slot velocity will ordinarily be sufficient[3].

This discussion so far has dealt with the difficulties in obtaining a given air velocity a short distance in front of a hood. It is common knowledge that air will carry a considerable distance when discharged from an open pipe and many people in the field of industrial ventilation apparently believe the velocity contours can be interchanged between the suction and pressure ends of a pipe.

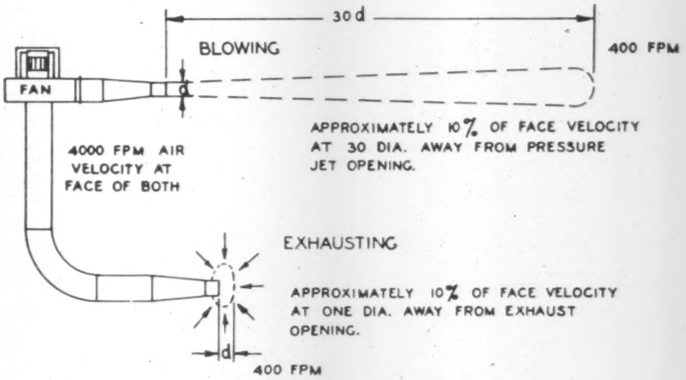

30 d
BLOWING
400 FPM
FAN
d
APPROXIMATELY 10% OF FACE VELOCITY AT 30 DIA. AWAY FROM PRESSURE JET OPENING.
4000 FPM AIR VELOCITY AT FACE OF BOTH
EXHAUSTING
APPROXIMATELY 10% OF FACE VELOCITY AT ONE DIA. AWAY FROM EXHAUST OPENING.
d
400 FPM

Fig. 5 — Air discharged as a jet carries a long distance but air withdrawn by suction influences surroundings for only a short distance

Fig. 5 shows pictorially how measurable velocities can be obtained approximately only one diameter out from the hood on the suction side of the system, whereas equal velocities may be obtained some 30 diameters from the discharge end of a system. This again is true because of the airflow pattern, as that on the suction side covers a relatively large area and that being discharged covers a smaller diameter area and extends out much further in length.

Many pages have been written as to the air volumes and velocities required for definite operations[4]. However, none of the information means a great deal unless the designer has a concept of the basic fundamentals of airflow into hoods and then makes every effort to design the hood properly. When the basic concepts are understood, hoods may be designed to do most anything desired of them. When valuable materials are involved, the hood face velocity is kept low so that only the truly air-borne material is captured.

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[2] ASHVE Research Report No. 1295—Energy Losses at Suction Hoods, by Allen D. Brandt and Russell J. Steffy (ASHVE Transactions, Vol. 52, 1946, p. 205).

[3] Velocity Characteristics of Narrow Exhaust Slots, by Leslie Silverman, Journal of Industrial Hygiene and Toxicology, November, 1942.

[4] Heating, Ventilating, Air Conditioning Guide 1946, Chapter 46 (published by American Society of Heating and Air-Conditioning Engineers, New York, N. Y.).

The terrace in front of the Clubhouse on the Manoir Richelieu Golf Course.

On to Murray Bay!

The Semi-Annual Meeting of the Society, June 24, 25, 26, 1957, is only a month away. In a few short weeks members from all over the United States and Canada will be arriving at Murray Bay, Canada, by steamer, train or car for an outstanding 3-day meeting in the Manoir Richelieu on the shore of the St. Lawrence River.

Advance steamer and hotel reservations have been steady and all indications point to a successful attendance. The combination of an excellent program of papers and symposiums plus the attraction of summer in Canada is a compelling argument in favor of attendance.

The Semi-Annual Meeting will be called to order by Pres. P. B. Gordon on Monday afternoon, June 24. The Meeting will consist of 6 sessions during which time approximately 14 papers and 2 symposiums will be presented.

The papers and the symposiums are listed in the programs on the following page. They were selected by the Program and Papers Committee, Walter A. Grant, Syracuse, N.Y., chairman, to provide an interesting variety of timely subjects.

It will be noted that the group of papers scheduled for the Third Session might be called a Topical Session on Sound and Vibration, preceding the Symposium on Sound and Vibration which is the Fifth Session.

One of the papers included in the Topical Session reports on an evaluation of 4 methods for determining acoustic-power output by octave band analysis. Data were obtained by measurements of acoustic power from a 15-in. centrifugal fan, and a conclusion was reached that at least 1, and in some cases 2, of the test methods seem well adapted for determining the acoustic-power output of air-moving equipment.

The Fourth Session, among other papers, offers a presentation of a short theoretical and experimental investigation of conditions where acoustic coupling could take place between an oil- or gas-fired central heating unit and the room in which it is placed.

Another paper in the same session presents the results of tests on 2 oil-fired warm air furnaces run under various conditions of intermittent operation. The tests showed that the performance under intermittent firing is different from that under continuous firing and the author dis-

(Continued on page 162)

Transportation Rates* from Chapter Cities to Montreal

(Add approximately **$11.80** *to determine Round Trip Rail Fare to Quebec, and approximately* **$18.65** *to determine Round Trip Air Fare to Quebec.)*

City	1st Class Round Trip By Rail	One Way Roomette or Seat	Round Trip By Air
Albany, N.Y.	$ 22.65	$ 2.50	$ 31.60
Albuquerque, N.M.	159.45	37.65	243.70
Atlanta, Ga.	107.81	23.60	138.40
Austin, Tex.	152.80	34.10	234.30
Baltimore, Md.	56.92	10.55	66.40
Baton Rouge, La.	127.00	31.50	188.00
Battle Creek, Mich.	**56.05**	**12.20**	92.45
Boston, Mass.	31.29	8.10	36.00
Buffalo, N.Y.	32.50	5.60	55.00
Charlotte, N.C.	87.96	19.15	115.60
Chicago, Ill.	72.75	14.40	103.90
Cincinnati, Ohio	69.75	13.25	103.00
Cleveland, Ohio	53.65	10.55	77.30
Columbia, S.C.	95.26	20.90	122.50
Columbus, Ohio	62.30	13.25	89.80
Dallas, Tex.	139.05	31.00	210.30
Dayton, Ohio	64.50	13.25	99.20
Denver, Colo.	144.70	31.50	214.30
Des Moines, Ia.	94.85	20.70	142.60
Detroit, Mich.	44.70	7.00	72.45
Edmonton, Canada	154.80	27.10	262.45
El Paso, Tex.	172.05	37.65	257.50
Ft. Worth, Tex.	139.05	31.00	210.30
Grand Rapids, Mich.	57.55	10.55	98.05
Greensboro, N.C.	78.50	17.50	106.00
Hartford, Conn.	31.30	8.10	36.50
Houston, Tex.	155.45	33.60	210.70
Indianapolis, Ind.	72.35	15.50	110.20
Jackson, Miss.	116.55	31.50	182.10
Kansas City, Mo.	101.85	20.20	153.60
Little Rock, Ark.	112.00	23.80	173.00
Los Angeles, Calif.	212.20	48.20	319.10
Louisville, Ky.	78.99	16.00	104.50
Lubbock, Tex.	147.75	35.10	220.65
Memphis, Tenn.	133.16	27.80	145.80
Milwaukee, Wis.	78.70	14.40	110.00
Minneapolis, Minn.	101.05	22.50	134.75
Moline, Ill.	82.85	20.70	122.90
Newark, N.J.	40.18	8.10	45.60
New Orleans, La.	146.01	30.34	183.70
New York, N.Y.	36.66	8.10	45.60
Norfolk, Va.	78.01	16.20	85.50
Oklahoma City, Okla.	128.45	27.65	191.30
Omaha, Nebr.	104.55	20.70	156.50
Ottawa, Canada	8.10	1.00	13.95
Philadelphia, Pa.	47.34	8.10	56.90
Phoenix, Ariz.	190.95	45.00	286.00
Pittsburgh, Pa.	78.61	16.20	86.70
Portland, Ore.	199.55	38.20	319.10
Sacramento, Calif.	212.20	48.20	331.50
St. Louis, Mo.	86.95	16.60	123.50
Salt Lake City, Utah	176.45	37.65	275.20
San Antonio, Tex.	158.60	35.10	221.70
San Francisco, Calif.	212.20	48.20	319.10
Seattle, Wash.	190.30	33.25	319.10
Shreveport, La.	149.51	31.85	190.00
Spokane, Wash.	179.75	43.55	297.10
Springfield, Mass.	28.31	8.10	57.40
Syracuse, N.Y.	27.55	8.10	36.50
Toledo, Ohio	53.65	11.05	81.95
Toronto, Canada	24.05	5.60	45.00
Tulsa, Okla.	121.85	27.65	185.85
Vancouver, Canada	190.30	33.25	326.50
Washington, D.C.	60.72	10.55	71.10
Wichita, Kans.	119.45	27.65	177.80
Winnipeg, Canada	97.30	17.50	164.50

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*Above rates subject to 10% tax; also subject to change without notice. All rates subject to prevailing foreign exchange rates.

Advance Technical Program

Manoir Richelieu **Semi-Annual Meeting, Murray Bay, Que., Canada** **June 24-26, 1957**

Saturday — June 22

2:00 p.m. Committee Meetings

Sunday — June 23

10:00 a.m. Lawn Bowling for Ladies
1:30 p.m. REGISTRATION
2:00 p.m. Council Meeting
2:00 p.m. Research Executive Committee
3:30 p.m. WELCOME TEA

Monday — June 24

9:00 a.m. REGISTRATION
9:00 a.m. Committee Meetings
10:00 a.m. Lawn Bowling for Ladies
2:00 p.m. FIRST SESSION
Call to Order — Pres. P. B. Gordon
Greetings by D. Lorne Lindsay, Chairman, Committee on Arrangements
Thermal Circuit Analysis for Developing Application Engineering Information, by S. F. Gilman and O. W. Clausen
Thermal Performance of Frame Walls, Part III — Wall Surface Temperatures, by G. O. Handegord
Saturation Pressure of Water on the New Kelvin Temperature Scale, by J. A. Goff (by title only)
2:00 p.m. SECOND SESSION
Call to Order — 1st Vice Pres. E. R. Queer
SYMPOSIUM ON AIR-CONDITIONING INSTRUMENTATION
C. H. Pesterfield, Symposium Chairman
R. N. Pond, Moderator
The Fundamentals of Commercial Controls — V. Robert Baird
Control of High Velocity Single Duct Systems — W. G. Young
Control of High Velocity Double Duct Systems — H. W. Alyea
Coordination of High Velocity Design — L. F. Flagg
2:30 p.m. Ladies Fashion Show and Tea
7:00 p.m. Buffet Supper
8:30 p.m. Habitant Evening
9:00 p.m. Dancing

Tuesday — June 25

9:00 a.m. REGISTRATION
9:30 a.m. THIRD SESSION
Call to Order — 2nd Vice Pres. A. J. Hess
TOPICAL SESSION ON SOUND AND VIBRATION
H. A. Lockhart, Chairman
Equipment for Room Noise from Air Conditioning — C. M. Ashley
An Evaluation of Four Methods for Determining the Sound-Power Output of a Fan — W. F. Kerka
Acoustic Power Level Determination for Machinery in Hard Rooms — W. J. Burch
Studies in Silencing a Diesel Driven Heat Pump — H. H. Vickers and R. W. Sage
9:30 a.m. FOURTH SESSION
Call to Order — Treas. C. H. Pesterfield
Acoustic Coupling of Residential Furnaces with their Surroundings, by C. F. Speich, W. R. Dennis and A. A. Putnam
Performance of Intermittently-Fired Oil Furnaces, by W. G. Colborne
Measurement of Infiltration in Two Residences, Parts I and II, by D. R. Bahnfleth, T. D. Moseley and W. S. Harris
Design and Calibration of a Portable Infiltration Meter, by C. W. Coblentz and P. R. Achenbach (tentative)
10:00 a.m. Ladies Putting Contest
1:30 p.m. Golf Tournament
2:00 p.m. Ladies Tour
7:00 p.m. BANQUET

Wednesday — June 26

9:00 a.m. REGISTRATION
9:30 a.m. FIFTH SESSION
Call to Order — 1st Vice Pres. E. R. Queer
SYMPOSIUM ON SOUND AND VIBRATION
John Everetts, Jr., Symposium Chairman
J. B. Graham, Moderator
Noise Control Problems and Air-Conditioning Equipment — R. J. Wells
Techniques of Sound Power Level of Unitary Equipment — R. N. Hamme
Sound Standards for Testing and Rating — H. C. Hardy
Application of Standards to Equipment — R. E. Parker
A Method for Estimating Octave Band Level of Noise Generated by Air-Conditioning Systems — F. B. Holgate and Sidney Baken
9:30 a.m. SIXTH SESSION
Call to Order — Pres. P. B. Gordon
Performance Testing of Roof Ventilators, by J. J. Wannenburg
Jet Velocities from Radial Flow Outlets, by Alfred Koestel
Velocities and Temperatures on Axis of Downward Heated Jet from 4-Inch Long-Radius *ASME* Nozzle, by Rudiger Knaak
Report of Resolutions Committee
Unfinished Business
New Business
Adjournment
10:00 a.m. Ladies Handicraft Exhibition Demonstration

ROUND-TRIP STEAMER SCHEDULE

Leave Montreal	**Arrive Murray Bay**
Friday, June 21, 6:45 p.m.	Saturday, June 22, 11:30 a.m.
Sunday, June 23, 6:45 p.m.	Monday, June 24, 11:30 a.m.

(For Saguenay River Trip en route take June 21 Steamer, disembarking at Murray Bay, Sunday, June 23, 1:10 p.m. EST)

Leave Murray Bay	**Arrive Montreal**
Thursday, June 27, 1:00 p.m.	Saturday, June 29, 7:00 a.m.
(includes Saguenay River Trip)	
Friday, June 28, 1:25 p.m.	Saturday, June 29, 7:00 a.m.
(direct to Montreal)	

STEAMER RATES PER PERSON

	STATEROOM 2 BERTHS, HOT & COLD WATER	STATEROOM 2 BERTHS, LAV., HOT & COLD WATER	STATEROOM TWIN BEDS & BATH
Round Trip Montreal to Murray Bay, including meals, transportation	$44.70	$47.70	$56.70
Round Trip Montreal to Saguenay River with stopover at Murray Bay, including meals, transportation	68.50	74.50	86.00

D. Lorne Lindsay
General Chairman

F. A. Hamlet
Honorary Chairman

G. Lorne Wiggs
Honorary Chairman

W. G. Hole
Assistant Chairman

SEMI-ANNUAL MEETING
Committee on Arrangements

June 24-26, 1957 Murray Bay, Canada

General Chairman
D. Lorne Lindsay

Honorary Chairmen
F. A. Hamlet
G. Lorne Wiggs

Assistant Chairmen
W. G. Hole B. J. Horsburgh
R. J. Ker H. G. S. Murray

B. J. Horsburgh
Assistant Chairman

R. J. Ker
Assistant Chairman

Sessions—E. Williams; **Ladies**—A. E. Horsburgh; **Finance**—Ralph Grossman
Entertainment—G. N. Martin; **Reception and Registration**—W. W. Timmins

(*Continued from page* 160)

cusses the factors causing the changes in performance.

Of course, interesting as these subjects are to the members, no Society meeting is complete without an attractive program for the benefit of the ladies and children. The Committee on Arrangements of the Montreal Chapter, D. Lorne Lindsay, general chairman, is rapidly completing the details for just such a program.

For example, beginning Saturday, June 22, through Wednesday, June 26, there will be a continuous selection of events for the children to participate in such as picnics, a treasure hunt, movies, swimming and athletic activities. There also will be a special Children's Banquet on Tuesday evening.

While the men are learning the latest about such subjects as Air-Conditioning Instrumentation or Sound and Vibration, the ladies will have an opportunity to view the newest fashions in furs and sports apparel. They also will be able to take in the scenery on several tours, view a demonstration of native handicraft, and compete in a putting contest.

Those who plan to arrive at the Manoir Richelieu on Saturday can look forward to informal golf, tours and dancing in the evening. Sunday there is fishing, golf, miniature golf, lawn bowling, an afternoon concert, and even a choice of movies.

Monday morning the ladies, and those men not obliged to attend committee meetings, may take advantage of informal golf on the world-famous Manoir Richelieu golf course or use the time pleasantly enjoying scenic tours. Photography enthusiasts will have a field day recording the colorful scenery of the Laurentians and surrounding area.

Monday evening there will be a Buffet Supper and Habitant Party with French Canadian entertainment and dancing. This will provide an opportunity for everyone to determine who is at the Meeting and make plans for renewing old acquaintances and making new friends.

The Semi-Annual Banquet will be held on Tuesday evening at which time the winners of the Annual ASHAE Golf Tournament will be presented with their appropriate trophies. Dancing will follow after the banquet.

Sight-seeing in Canada, the overnight steamer to Murray Bay from Montreal and the relaxing atmosphere of the Manoir Richelieu create a perfect backdrop for what promises to be an outstanding Semi-Annual Meeting. Be there and see!

SUGGESTED AUTO ROUTES

From Chicago and Vicinity — Take Indiana, Ohio, Pennsylvania Turnpikes and New York Thruway to Syracuse, Route 11 through Watertown to Malone and Route 4 across the border to Huntingdon and Montreal. Route 2 from Montreal to Quebec and Route 15 to Murray Bay (La Malbaie).

From New York — New York Thruway to Albany, Route 9 to Montreal and continue as from Chicago. Alternate route, avoiding Montreal, is to continue on Route 9 to Quebec City via south shore of St. Lawrence River. Faster but not scenic.

Boston and Vicinity — Turnpike to Augusta, Me., Route 201 to border at Jackman, continue on Route 23 then 28 to Quebec City, and continue as from Chicago.

Note: There is a ferry from Riviere-du-Loup to St. Simeon for scenic trip through Maritime Provinces or Gaspe Peninsula, but ferry does not run on Sunday.

Studies in Silencing a Diesel Driven Heat Pump

By H. H. Vickers[*] and R. W. Sage[**], Linden, N. J.

SUMMARY—A successful program has been completed to silence a diesel engine for use indoors to drive a heat pump. Diesel noise level was reduced so a 5-ton capacity unit was as quiet as a good household oil burner. By making use of engine exhaust heat and incorporating speed control, the heat pump unit required to give 5 tons capacity could be halved on a low temperature design basis without resorting to expensive resistance heating. The paper outlines the procedures employed and the equipment used. The final unit was quiet, compact, neat in appearance, fully automatic and independent of external power sources.

WIDESPREAD interest in some form of summer cooling has been amply demonstrated by the expanding sales of room air conditioners and by the rapid development of a market for central air-conditioning units even for small homes. The central units usually consist of conventional cooling units and attached furnaces, or of the all-electric heat pump. However, in the colder areas where the heat pump suffers from lower efficiency as the outside temperature drops, the investment and operating costs of the all-electrical system are normally higher than competitive systems. This is because resistance heating is used to supplement the heat pump output rather than size the heat pump itself to provide all the heat at the lower temperature.

However, the heat pump is not limited to an electric drive as others have pointed out. In this study, a diesel engine drive has been adapted to an otherwise *normal* heat pump. This engine, incorporating speed control and exhaust heat recovery, can handle a larger heating load relative to the cooling requirement than can the constant-speed electric drive.

The study concentrated on the technical difficulties that would have to be overcome before the diesel engine could be seriously considered for home use. It had to be made fully automatic and quiet. The noise problem seemed more difficult since conventional diesel engines are frequently noisy and would be totally unacceptable in the basement of the average home. Therefore, the work discussed herein traces the steps taken in adapting a diesel engine to a heat pump and reducing the noise from an intolerably high level to a murmur, even quieter than a quiet oil burner.

Apparatus and Tests

The heat pump used was a standard commercial 1954 5-ton unit, air-to-air machine. It uses Refrigerant 12 and has a 5 hp compressor motor with a belt-driven compressor operating at 875 rpm. It consists basically of a compressor, condenser coil, expansion valve and evaporator coil with transfer valves to reverse the cycle when needed. Indoor air is forced over one of these coils to either heat or cool the house and outdoor air is forced over the other to either pick up or give out heat. The heating capacity of this unit varies from 70,000 Btu per hr at 50 F to 34,000 Btu per hr at 0 F. If more heat is needed at low temperatures, it is normally supplied automatically by electric resistance heaters.

The diesel engine selected was an air-cooled 4-cycle single-cylinder engine with 3.15-in. bore, developing 5 hp at 1500 and 6 hp at 1800 rpm. It weighed 390 lb and had a fuel consumption of 0.47 lb per hp-hr under the test conditions at full load. The engine was equipped with a 12 volt battery, starting motor, generator and an oil filter.

The automatic controls were battery operated and contained all the relays, switches and timing elements for automatically starting and stopping the engine. A thermostat automatically starts the diesel engine and heat pump or reverses the heat pump cycle to supply either hot or cold air and maintains the desired temperature within 2 deg of any manual presetting.

Although an air-cooled engine was used, later studies indicate that engine heat might be used more effectively if picked up by a water jacket and delivered to a radiator. A water-cooled engine should also be quieter than an air-cooled engine due to the noise absorbing effects of the water and cooling jacket wall and the elimination of sheet metal air cooling ducts.

Before discussing in greater detail the tests that were carried out in silencing the diesel engine, it might be well to review the reasons for choosing the diesel prime mover and the advantages that could exist over an electrical drive. They are as follows:

1. Lower energy cost in most areas.
2. Automatic speed control.
3. Waste heat from the engine can be used instead of supplemental resistance heating to reduce the size of the compressor, indoor and outdoor coils, and both air blowers.
4. Can be adapted to provide hot water.
5. Can be made totally independent of outside power.
6. Can deliver heat at a higher level due to the high level heat of the engine cooling system.

The output power cost for a diesel engine at 28 percent efficiency with 14 cents per gal fuel is 36 cents per

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[*] Chemicals Research Division, Esso Research and Engineering Co.

[**] Process Research Division, Esso Research and Engineering Co.

For presentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Murray Bay, Que., Canada, June 1957.

1000 Btu *vs.* electric power costs at 2 cents per kwhr of 60 cents per 1000 Btu.

The load as well as the heating capacity of the usual constant speed electric heat pump varies with outside temperature. Paradoxically, at low temperatures when the heat demand is greatest, the load on the compressor is smallest, due to low evaporation rates. A diesel engine with speed control, would give greater output at low temperatures resulting in a smaller design size and give modulated output when either heating or cooling.

The heat generated by a diesel engine can be collected, preferably with a water jacket on the engine and exhaust, and delivered to a radiator in the indoor warm air ducts. The total heat available from this source is 72 percent of that present in the fuel, 28 percent going to mechanical energy. The 28 percent to mechanical energy is used by the heat pump with a coefficient of performance (CP) of 2.2 at 0 F outdoor temperature for a return of 61 percent of the total energy in the fuel. If 85 percent of the remaining 72 percent can be utilized, the only loss being the cooled exhaust, then the return from the cooling jackets would be 60 percent of the total energy in the fuel. Therefore, the heat recovered from the engine jackets is equal to the output from the heat pump. Thus, for a given cooling capacity, the heating output can be increased to nearly double that of the usual electrically-driven heat pump without resorting to resistance heating.

The engine can also drive a generator to provide power for operation of the air circulating fans or direct pulley drives could be arranged. Either of these methods, coupled with the battery operated engine controls, makes the unit completely independent of outside power sources.

The noise level of the silenced diesel engine alone proved to be half that of the present heat pump. If advantage is taken of all possibilities the diesel-driven heat pump would be as quiet as a good oil burner, with a noise level competitive with an electric-driven heat pump of the same capacity.

A number of performance tests were made during these studies. Typical results are summarized (Table 1).

These data were taken with both the air inlet and outlet in the same room and some mixing no doubt occurred; however, these data check well with that expected and with the manufacturer's published capacities after allowance is made for the different compressor speeds. More extensive tests would be required to check the exact value of the hot engine cooling air being delivered to the outdoor coil during the heating cycle.

Table 1—Typical Results of Performance Tests

	Cooling cycle	Heating cycle
Engine speed, rpm	1400	1200
Rated hp	4.6	4.0
Compressor speed, rpm	548	470
Outdoor air to heat pump, F deg	93	57
Outdoor air from heat pump, F deg	—	47
Exhaust air from heat pump, F deg	103	—
Room air to heat pump, F deg, dry-bulb	72	73
Room air to heat pump, F deg, wet-bulb	62	61
Air from heat pump to room, F deg, dry-bulb	57	110
Air from heat pump to room, F deg, wet-bulb	53	71
Relative humidity, in, percent	57	49
Relative humidity, out, percent	78	12
Hot water from exhaust jacket, lb/hr	100	100
Water ΔT, F deg	68	70
Heat Balance		
In: fuel used	Kerosene	Heating oil[a]
lb/hr	1.87	2.01
Btu	37,000	39,200
Out: sensible heat	23,000	50,000[b]
latent heat	14,200	—
heat to water	6,800	7,000
Total	44,000	57,000
Coefficient of Performance	1.01[c]	1.46

[a]No. 2 heating oil. [b]To air. [c]Cooling only.

No difficulties were encountered in several hundred hours of operation with either the heat pump or the diesel engine.

Acceptable Noise Level and General Aspects of Noise

Before attempting to reduce the noise level of the diesel engine, an acceptable noise level had to be established. A noise level was required for the engine that would not be annoying or, if possible, would not be heard through the floors or walls of a private house in a quiet residential area. This required consideration of the general aspects of noise because sound pressure in decibels is not directly related to the annoyance it can cause.

Loudness is a subjective quantity measured by the human ear. It is a function of the intensity of sound but is complicated by other factors. It is also dependent on continuity and frequency. Intermittent noises common to most internal combustion engines attract attention and require special consideration, but advantage can be taken of the idiosyncrasy of the human ear where loudness varies with frequency.

Loudness level contours have been established[1] from a statistical analysis of hearing tests, in which many people matched the level of one tone to the loudness of another. These *Fletcher Munsen* loudness contours, used to convert decibels into phons or loudness units, are illustrated in Fig. 1. Phons are equal to decibels at 1000 cps but vary at other frequencies depending on intensity. Advantage was taken of this phenomenon by giving more attention to the critical regions of the sound spectrum. For instance, the soundproofed diesel engine has a sound level of 83 db, but has a loudness level of only 58 phons.

Hale Sabine converted equal loudness contours into equal annoyance contours[2] as shown in Fig. 2. By comparing the sound spectra of different household appliances with Sabine's annoyance contours, a contour for a satisfactory annoyance level was taken as a goal. This contour was slightly higher but followed very closely the sound spectrum of a quiet oil burner.

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[1] Exponent numerals refer to the References.

Comparisons were also made to a third family of curves[3] showing the average reaction to different levels of outdoor noise in a residential area (see Fig. 3).

The least difference in sound intensity that the ear can detect is about 1 db. Doubling the intensity of a sound results in a 3 db increase, but doubling the loudness requires a 10-db or 10-fold increase in intensity; a 20-db increase or decrease signified a 100-fold change in intensity.

A diesel engine includes many possible noise sources. To reduce the noise to the established goal was a complex task. An accurate sound instrument was required that would separate and pin-point the source of each noise. For this purpose, an audio frequency spectrometer and automatic recorder was used. This instrument sweeps through the audio spectrum and draws it on a chart in 27 one-third octave steps with totals in both phons and decibels. The instrument can also be manually set for any particular frequency band. A probe microphone and a vibration pick-up were used with this instrument for hundreds of local and overall spectrum recordings that made a difficult task seem relatively simple.

Silencing the Engine

General Aspects: The diesel engine was silenced in a stepwise manner without any particular preconceived plan other than to attack the major noise makers first. As each major noise was reduced, other noises became apparent and were reduced in turn. Due to this method of approach, it is not possible to state just how much each component contributed to the total noise.

The diesel engine was first installed in an engine laboratory and bolted directly to the floor with the exhaust leading outdoors through a flexible pipe. The engine was operated running free. During starting and stopping cycles, sympathetic vibrations were generated, possibly at the natural frequency of the floor. When the engine settled down to its normal running speed, the sound level dropped to about 106 db.

Commercial silencers were then installed on the intake and exhaust and a preliminary study made of various types of engine supports. The engine was mounted on a heavy angle iron frame supported in turn on vibration eliminators, next on rubber engine mounts, and finally on a solid concrete block, weighing about 1000 lb and resting on another set of vibration eliminators. Spectra showed that the rubber engine supports reduced the total noise level by 2 db and 4 phons. The concrete block reduced the low end of the spectrum considerably; however, this region is of less importance than those at the middle and more ear-sensitive regions. For this reason, and since a concrete block would be costly, it was removed and the studies continued without it.

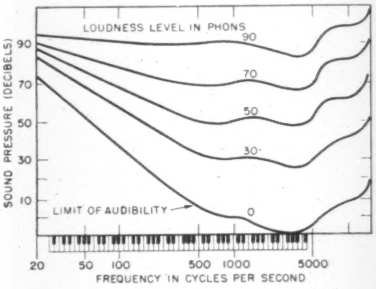


Fig. 1 — Contours of equal loudness (phons)

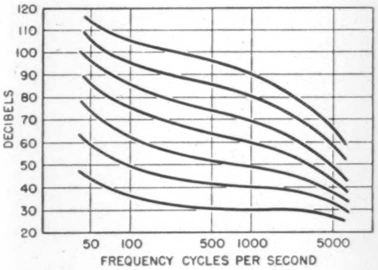


Fig. 2 — Equal annoyance contours

Supports and Vibrations: The diesel engine was next moved to a private laboratory and set up to drive the 5-hp heat pump. The engine was mounted on a steel plate which was rigidly connected to the compressor mounting on the heat pump unit and a belt-driven counter shaft connected the diesel engine to the compressor. The steel plate supporting the engine was mounted on 4 commercial vibration isolators directly under the engine at one end, and the other end rested on the springs that had supported the 5-hp motor in the heat pump unit.

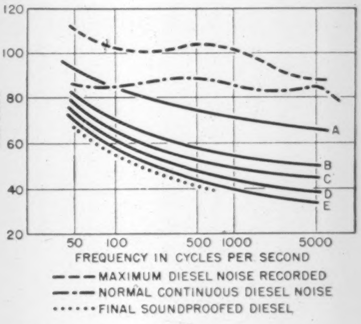


Fig. 3 — A community's reaction to outdoor noise. Curve A — vigorous legal action; Curve B — threat of legal action; Curve C — strong complaints; Curve D — mild complaints; Curve E — mild annoyance

This arrangement resulted in severe vibrations and a careful study was made to determine the type and arrangement of supports that would transmit the least vibration. As a result, a final selection was made of rubber engine mounts directly under the engine plus vibration isolators with light springs. The cork snubbers in the isolators were replaced with butyl rubber which considerably reduced the horizontal vibration transmitted to the floor. The main purpose of the rubber engine mounts was to stop the mechanical transmissions of sound between the engine and supports. This combination of rubber and light springs resulted in almost complete elimination of the objectionable vibrations that had been originally transmitted to surrounding structures.

Combustion Air Intake: A soundproof box with walls 12 in. thick and designed for easy modification was next built around the engine, leaving the combustion air intake on the outside. Sound recordings showed a drop in the noise level across the entire spectrum by 5 db and 12 phons. However, the noise from the combustion air intake could now be heard over the total engine noise, showing that it had to be silenced too. For simplicity, the engine air intake was placed inside the soundproof box with air passing into the box through a labyrinth. This gave the desired reduction.

Engine Exhaust: Engine exhaust noise was studied next. As would be expected, the comparison showed the need for considerable noise reduction and a silencer was designed that would fit in the bottom of a chimney. This silencer was composed of an 8-in. diameter steel pipe with 4 solid baffle plates inside, spaced on 6-in. centers and connected by 1½-in. diameter nipples. Recordings made with this 8-in. pipe muffler showed the noise level to be below the assumed acceptable level right across the spectrum, as illustrated in Fig. 4. The exhaust pipe and silencers gave a total back pressure of 0.15 in. of mercury at 1200 rpm.

Miscellaneous Engine Noises: The noise level was now at a point where close attention had to be given to details. For this purpose a probe-microphone was used. The microphone picked up a noise from the fuel tank bracket that seemed to be as loud as the rest of the engine. This bracket was bolted rigidly to the engine cylinder and was vibrating much like a loud-speaker. While a 6 × 3½-in. oval hole in the bracket eliminated most of this noise, the tank was removed, as it would be in a household unit, and noise level dropped 4 db.

Further studies with the probe-microphone to locate the source of peak noises that appeared in the

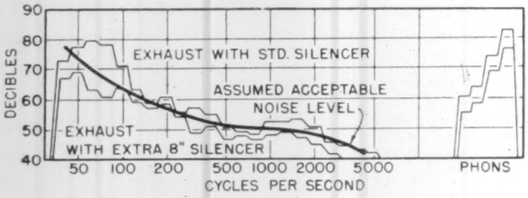


Fig. 4 — Exhaust silencing

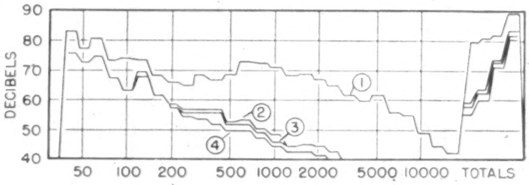


Fig. 5 — Sound reduction for insulating materials. Curve 1 — box panel open and microphone 2 ft away; Curve 2 — box panel closed with gypsum board; Curve 3 — pleated mineral wool added; Curve 4 — ¼-in. wood fiber hardboard outer casing added

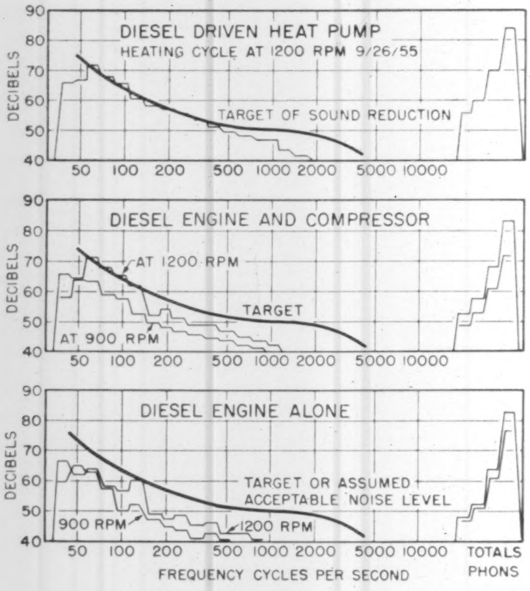


Fig. 6 (above) — Final sound spectra of diesel and heat pump

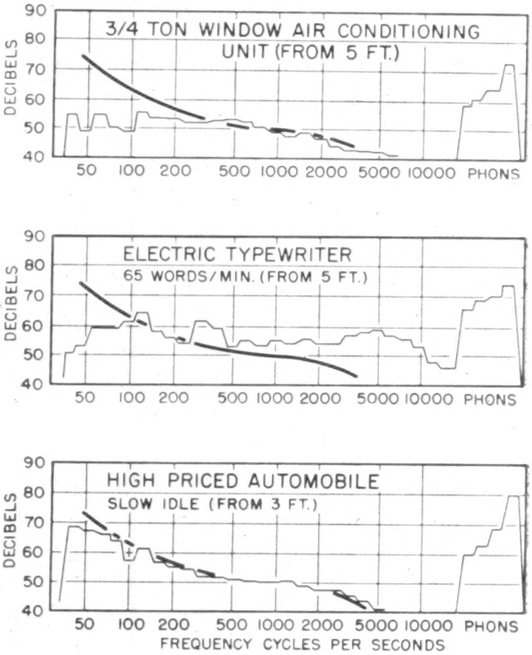


Fig. 7 (right) — Sound spectra of other equipment compared to specified target

overall spectrum led to minor changes that gave appreciable silencing. As typical of those changes, reductions of 6 db and 8 phons were gained by replacing the injection nozzle cover with a new, insulated cover. Noises transmitted mechanically along the fuel line to the soundproof box casing were eliminated by inserting a short section of rubber hose in the line. A 400 cps whine was traced to the air circulation fan blades on the fly wheel, there being 20 blades revolving at 20 rps. This noise was cut down with a slotted metal cover to reduce impingement velocity of the entering air.

The miscellaneous engine noises had by now been so reduced that the entire character of the engine noise seemed changed. Instead of the original confusing clatter, the simple engine noises could now be clearly distinguished and the overall noise level of the engine open to the room was reduced from 106 to 90 db and from 114 to 80 phons. This is equivalent to a 15-*fold reduction* in loudness.

Sound Insulating Box: The engine noise was now at a point where further work on the engine seemed unnecessary, but the so-called *soundproof* enclosure was big and bulky. An investigation of different insulations was made in an effort to reduce its size. After studying many sound deadening materials in a multitude of combinations, the most effective was a 6-in. thick sandwich of a mineral-wool-faced gypsum board on the inside and a casing of $\frac{1}{4}$-in. tempered wood fiber hardboard on the outside with a pleated mineral wool blanket between. The progressive effects on the sound spectrum of adding these materials to the test panel are shown in Fig. 5. The total wall thickness might also be reduced from the present 6-in. thickness because, as the spectra show, nearly all of the sound attenuation is obtained by the gypsum board.

Spectra of the soundproofed engine alone, of the engine and compressor at different speeds, and of the complete diesel heat pump together with the assumed acceptable noise levels are shown in Fig. 6. The curve of the assumed acceptable sound level is for conditions indoors. If the sound spectrum matches this curve 9 ft from the engine, then the noise would not be noticed through any floor or partition, because the average wall of a house will reduce the noise level by another 10 db or more, if there is no direct mechanical transmission.

For comparison of the soundproofed diesel engine with other noise producers, the spectra of a $\frac{3}{4}$-ton window air-conditioning unit, an electric typewriter at 65 words a minute, and a high-priced automobile idling, are shown in Fig. 7.

Conclusions

The conclusions gained from this study are that the noise of a diesel engine can be reduced to a satisfactory level for a heat pump drive, providing the entire unit is engineered and designed to take advantage of all the possibilities peculiar to this combination. The diesel engine is a reliable drive and maintenance should be reasonable, perhaps requiring a carbon clean-out about twice a year with a more complete overhaul every 2 years. By using an enlarged oil pan, the oil could be made to last as long as a 275-gal tank of fuel and could be changed regularly by the fuel delivery man.

A well designed diesel-driven heat pump could be fully automatic, independent of outside power, and reasonably trouble free; it could fit inside a cabinet about 5 ft square × 4 ft high and could supply modulated year-round air conditioning at a lower operating cost and with less noise than the present all electric units. It could also supply hot water and in addition, drive a generator for emergency home power.

A diesel-engine drive has, however, several disadvantages: (1) it will require a well-trained service man; (2) the compressor cannot be hermetically sealed, as are all the latest household refrigeration units; (3) the starting battery water and crankcase oil will need periodic inspection; (4) it requires a chimney for the exhaust; (5) it may have noticeable chimney exhaust odor under certain conditions; (6) it requires more floor space than other units of the same capacity.

Operating costs for the diesel, though not discussed herein, are lower than for the all electric unit. Investment costs are higher because of the higher first cost of the diesel engine. The smaller size of the heat pump, when diesel driven, does save some investment but not nearly as much as the added cost of the engine. Also, while the cost of small diesels would decrease if mass produced for the heat pump market, the diesel driven unit would still cost more than the all electric unit. Rough estimates including maintenance show the operating savings might amortize the higher cost in 3 to 4 years in an average situation.

References

1. Auditory Patterns, by H. Fletcher (*Review Modern Physics*, 1940, 47-65).

2. Control of Noise, by J. S. Parkinson (*Noise Control*, January 1955).

3. A Community's Reaction to Noise, by K. N. Stevens, W. A. Rosenblith and R. H. Bolt (*Noise Control*, January 1955).

WARM AIR SHORT COURSE AT PURDUE

A 4-day short course on warm air heating was held at Purdue University, Lafayette, Ind., April 15-18. The course consisted of classroom sessions and of assigned problems together with 2 demonstrations, 1 on refrigeration cycle and component parts, and the other on resistance in ductwork.

Included on the staff which conducted the short course were the following members of the Society: F. W. Brundage, Kalamazoo, Mich.; F. W. Deady, Cleveland, Ohio; W. E. Garber, Jr., Indianapolis, Ind.; C. L. Grandstaff, Elyria, Ohio; H. G. Hays, Columbus, Ohio; J. R. McAdams, Chicago, Ill.; B. F. McLouth, Minneapolis, Minn.; W. T. Miller and F. B. Morse, West Lafayette, Ind.; W. D. Redrup, Huntington, Ind.; and G. A. Voorhees, Cleveland, Ohio.

1957 NUCLEAR CONGRESS AT PHILADELPHIA

The Society was one of the 24 sponsoring organizations of the 1957 Nuclear Congress coordinated by Engineers Joint Council and held in Philadelphia, March 11-15.

As the official representative of the Society at the opening of the Congress in the Philadelphia Convention Hall on March 10, John Everetts, Jr., Philadelphia, Pa., was present at the preview of the International Atomic Exposition held as a part of the Congress. First Vice Pres. E. R. Queer, University Park, Pa., also represented the Society at various sessions and was among those seated at the head table at the All-Congress Banquet at the Bellevue-Stratford Hotel, March 13.

The Congress attracted an attendance of more than 8,000 engineers, businessmen and scientists. During the course of the Congress more than 200 technical papers and panel sessions were programmed while approximately 150 exhibitors took part in the concurrent Exposition.

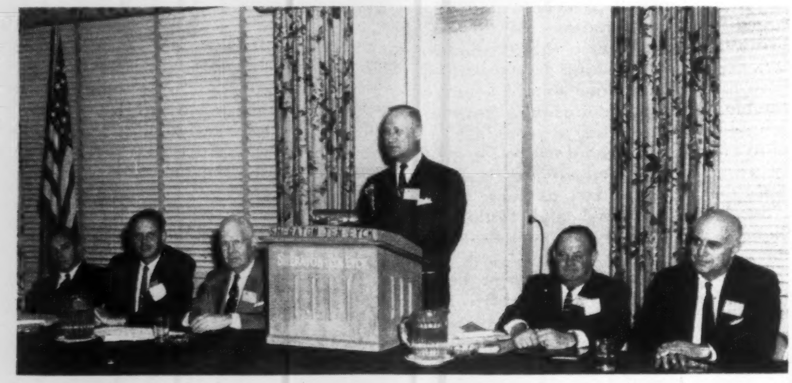
The Congress in general was devoted to peaceful use of atomic energy and included such topics as reactor design, disposal of radioactive wastes and use of isotopes in industry. The program did not include any papers specifically dealing with the use of atomic energy as a source for power for space heating.

Group attending the Regional Area 2 meeting at Detroit, Mich., on March 11: *(l. to r. front row)* E. R. Queer, Society 1st Vice President; P. B. Gordon, Society President; P. J. Marschall, Director Region 2; *(second row)* B. J. Walter, Western Michigan Chapter; R. G. Anderson, Cincinnati; H. W. Alyea, Wisconsin; R. A. Wilson, Central Ohio; W. F. Currise, Indiana; F. L. Murray, Western Michigan; J. A. White, Northern Ohio; *(third row)* J. B. Rishel, Miami Valley Chapter; R. D. Rodwell, Wisconsin; L. P. Brehm, Miami Valley; T. D. Reiley, Cincinnati; W. A. Schoonover, Central Ohio; F. W. Hofmann, Assist. to Exec. Secy.; *(fourth row)* H. G. Gragg, Illinois Chapter; E. F. Glanz, Michigan; J. F. Guest, Toledo; J. M. Groskopf, Toledo; P. S. Hosman, Michigan.

REGION 1 MEETING IN ALBANY

As a part of the program of regional meetings for 1957, the Chapters Regional Committee Meeting for Region 1 took place in Albany on March 29.

The regional meeting held at the Sheraton-Ten Eyck Hotel was presided over by John Everetts, Jr., regional director. Pres. G. G. Davis of the Empire State Capital Chapter was present to welcome the regional committee members. A. M. Lovenberg was elected to act as secretary for the meeting shortly after the morning session began at 9:30 a.m. The roll call indicated that all chapters were represented. A number of guests were also attracted to the meeting including several from the New York Chapter and the Connecticut Chapter. The group, therefore, comprised about 35.



(above) John Everetts, Jr., regional director, presiding at the Chapters Regional Committee Meeting for Region 1

(right) Some of the Members and Alternates of the Chapters Regional Committees in attendance at the meeting for Regional Area 1, held in Albany on March 29, 1957

At the luncheon meeting, 2nd Vice Pres. A. J. Hess, Los Angeles, Calif., spoke on *Progress of the Regional Plan.* As member of the Nominating Committee for 1957 the meeting selected W. C. Kruse, Jr., with E. K. Wagner as first alternate and L. A. Childs as second alternate.

In the evening the regional group joined with the Empire State Capital Chapter at a dinner meeting. Speaker for the occasion was Pres. P. B. Gordon, who chose as his subject, *Our Bottleneck — Technical Knowhow.*

MEMBERS HONORED AT COAST ENGINEERS WEEK

As a feature of the observance of Engineers Week in the San Francisco Bay Area, outstanding engineers were selected and received special commendations by the 1957 Bay Area Engineers Week Committee.

The general chairman, Clyde E. Bentley, member of the Society and consulting engineer, San Francisco, was 1 of 3 who received special commendation in recognition of outstanding service rendered to the profession.

Also honored was James B. Smith, secretary of the Golden Gate Chapter and manager of the San Francisco office of Johnson Service Co., who was one of the 10 young engineers selected to receive an award. The awards were made at a special awards luncheon held as a part of the Engineers Week observance.

ACHENBACH AT BUREAU OF STANDARDS

Paul R. Achenbach, past president of the Washington, D.C., Chapter, has become chief of the Air Conditioning, Heating and Refrigeration Division, National Bureau of Standards at Washington. Mr. Achenbach left his position at the Naval Medical Research Institute in Bethesda, Md., in order to undertake his new duties. Mr. Achenbach succeeds the late Richard S. Dill at the Bureau.

AMERICAN POWER CONFERENCE IN CHICAGO

With sponsorship by the Illinois Institute of Technology, the 19th annual American Power Conference was held in Chicago, March 27-29. A feature included a symposium on training and utilization of technical manpower. The 3-day program included altogether 25 technical sessions as well as a dinner on March 28 and 3 luncheon meetings. Among the 14 universities and 9 technical societies who took part was the Society's Illinois Chapter, H. G. Gragg, president.

HONORED BY LIFE MEMBERSHIP

Myron C. Beman, Buffalo, N.Y.—For the past 35 years Mr. Beman has conducted the consulting engineering partnership of Beman & Candee, Buffalo, N.Y. His work has included the design of heating, ventilating and air-conditioning systems, sanitary systems, and electrical and power installations for buildings, schools and plants.

M. C. Beman

Mr. Beman, who was born in Binghamton, N.Y., received his M.E. from Cornell University in 1905. He began his career with the Buffalo Forge Co. under W. H. Carrier. Some years later he became associated with Curtiss Aeroplane Co. in Buffalo.

After joining the Society in 1926, he became active in the Western New York Chapter, and was elected as its president for 1932. He was a member of the Society's Council from 1934-39 and served on a number of Society committees, including the Executive and Standards Committees. He is a professional engineer registered in New York and Pennsylvania.

Ralph B. Stanger, Pittsburgh, Pa.—Allied with the heating and ventilating field in the Pittsburgh area for over 40 years, Mr. Stanger has been sole owner of Robinson & Stanger, Pittsburgh, since 1921.

R. B. Stanger

Mr. Stanger was born in Pensauken, N.J. After leaving school he joined Warren Webster & Co., Camden, N.J., and was transferred to Pittsburgh in 1913. The partnership of Robinson & Stanger was formed in 1914 with offices in the Empire Building. Upon Mr. Robinson's retirement in 1921, Mr. Stanger became sole owner of the company.

A member of the Society since 1920, Mr. Stanger served as president of the Pittsburgh Chapter in 1932. He still continues his interest in the Society.

ACTIVITIES OF SOCIETY CHAPTERS

On the chapter circuit, everyone has been talking about the 63rd Annual Meeting of the Society. These Reports on Chicago are noted here, along with descriptions of the Technical and Non-technical Programs featured at chapter meetings. Special mention is made of the Purdue Students at Chicago. Listed also are the names of those who have been Cited and Selected for service to their chapters.

Reports on Chicago

At Chapter meetings throughout the country, members heard reports on the 63rd Annual Meeting of the Society, held in Chicago in February, and on the Exposition which ran concurrently. • • • Pres. J. B. Hoaglund told the ARIZONA Chapter why he had found the meeting interesting. • • • The success of the event was described by Pres. W. G. Robertson, Jr., who noted that BALTIMORE Chapter had been well represented. • • • At a BLUEGRASS Chapter meeting, C. B. Gamble, a member of Council and regional director of Regional Area 5, discussed the Exposition. • • • An interim report to the ILLINOIS Chapter by Secy. Herbert Kreisman advised that registration for the meeting reached a new high. • • • O. E. Bowers, James Hutsinpiller and J. L. Harvey, of the INLAND EMPIRE Chapter, recounted their experiences at the Exposition. • • • MINNESOTA Chapter heard a report on both the Meeting and the Exposition by A. B. Algren, a member of Council and regional director, Regional Area 3. • • • B. W. Farnes related impressions received during his trip to Chicago, particularly noting the good attendance at technical sessions. Also for the benefit of OREGON Chapter members, T. H. McClung pictured the size of the Exposition. • • • R. M. Stern, a member of the Society's Nominating Committee, was called upon for a report to the PACIFIC NORTHWEST Chapter. He stated that his committee decided on organizational procedures at Chicago and that nominations would be made at the Semi-Annual Meeting.

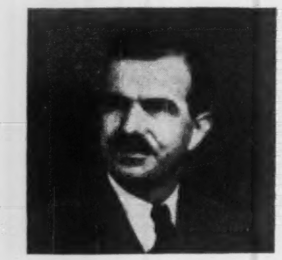
A. B. Algren

Technical Programs

ARIZONA Chapter members heard C. M. Sanders, Jr., market manager of electronic controls, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., speak on *Supervisory Data Centers*, completing the picture with slides. • • • R. E. Larkin, sales engineer, T. J. O'Brien Engineering Co., Memphis, Tenn., spoke to the ARKANSAS Chapter on fans for all purposes. His speech covered their selection, application and performance in reference to air handling systems. Visual illustrations were also shown. • • • C. B. Gamble, member of Council and regional director, Regional Area 5, addressed the BALTIMORE Chapter. Mr. Gamble, of Cary B. Gamble & Associates, New Orleans, La., gave an extremely interesting presentation on the problems involved in air conditioning rooms with large installations. His talk provoked a lively question and answer period which might have continued at some length had not Pres. W. G. Robertson, Jr., out of consideration for Mr. Gamble, called time and requested a motion to adjourn. • • • A film entitled *Corrosion in Action* was shown at a BRITISH COLUMBIA Chapter meeting. The film demonstrated in detail the various forms of metal corrosion and pointed out some ways to avoid corrosion problems. R. W. Hole

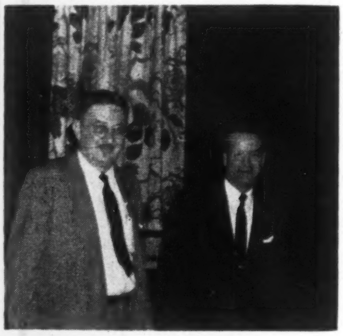
C. B. Gamble

Journal Section



C. M. Ashley

announced the program. • • • A past president of the CENTRAL NEW YORK Chapter, C. M. Ashley, chief staff engineer, Carrier Corporation, Syracuse, N.Y., spoke to his fellow chapter members on *Sound Measurements.* Mr. Ashley gave a thorough presentation, including discussion of frequency and intensity, and the effect of each on the other and on the listener. His talk was illustrated with a tape recording of different sound frequencies and intensities, compared with sounds of equipment common to our industry such as fans, compressors, and the like. • • • A description of the progress made in the marketing of fuel oil since the pioneering days of the 1920's was given to the Central New York Chapter on a previous occasion by E. J. Hamilton, fuel oil sales manager for central New York, Atlantic Refining Co. In the question and answer period following this discussion on *Oil as a Fuel*, Mr. Hamilton explained in some detail the problem of fuel oils *separating* during long storage, giving considerable emphasis on this problem with respect to blends. • • • *Venting Gas Appliances* was the topic covered by J. P. Waldrop, sales engineer, Metalbestos Division, William Wallace Co., Florence, Miss., for the DELTA Chapter. The chapter gave the speaker a rising vote of thanks at the conclusion of the talk. • • • A guest at an EL PASO Chapter meeting, G. M. Sebree, Albuquerque, N. Mex., introduced the speaker, Burt Dahm, sales manager, Roy E. Roth Co., Rock Island, Ill. The presentation on *Turbine Pumps* was followed by a question and answer period. • • • Four major classifications of grilles were discussed by H. E. Straub, research engineer, Titus Manufacturing Corp., Waterloo, Ia. Speaking before the ILLINOIS Chapter on *Principles of Room Air Distribution,* Mr. Straub outlined the results of comprehensive tests made on various types of outlet grilles for air distribution in residences. The types of air distribution named were: horizontal at the ceiling, vertical at the floor with no horizontal spread, vertical discharge with a spreading jet, and horizontal discharge at the floor. Mr. Straub advised that, in his opinion, the first 2 groups are best for cooling applications, while the 3rd is preferable for heating purposes. • • • A long-standing member of the INLAND EMPIRE Chapter, R. B. Campbell, sales engineer, Minneapolis-Honeywell Regulator Co., Spokane, Wash., spoke to his fellow members on the fundamentals of electrostatic air filtration. With the aid of W. F. Kelly, branch manager of the same company, and of many interesting slides, the theory of electrostatic filters was made very understandable. Mr. Campbell's talk was well received by the members. • • • IOWA Chapter members enjoyed 2 speakers on a single program: G. H. Neptune, thermal engineer, and E. M. Meyers, acoustical engineer, Gustin-Bacon Manufacturing Co., Kansas City, Mo. Mr. Neptune discussed thermal insulation and the effect of moisture in insulation. He emphasized the importance of proper design, stating that it is more difficult to design for humidity than temperature. Mr. Meyers treated the acoustical engineering of air-conditioning systems. It was pointed out that acoustic insulation has not reached the point of development that thermal insulation has. • • • The guest speaker at a KANSAS CITY Chapter meeting, J. K. Howell, elaborated on a system of control employing logic elements. Mr. Howell's discussion was illustrated, using slides, component parts and logic function demonstrator. • • • An informative talk on investigation in the field of steam absorption refrigeration and the development of the lithium-bromide type refrigeration equipment was presented before the MASSACHUSETTS Chapter by P. B. Krapfl, Servel, Inc., Evansville, Ind. • • • MIAMI VALLEY Chapter heard J. G. Liskow, assistant manager, Dust Control Division, American Air Filter Co., Louisville, Ky., in an address on *Industrial Ventilation.* The discussion was supplemented by a film dealing with this topic. • • • A tour of the mechanical equipment room of the Southdale Shopping Center was featured following a MINNESOTA Chapter meeting. James Eliot of the Southdale Co. conducted the tour. • • •



J. W. McA. Kreuttner, speaker, with J. B. Hewett, president, New York Chapter at the March meeting, Midston House, New York, N.Y.

At a NEW YORK Chapter meeting, J. W. McA. Kreuttner, vice president, Buensod-Stacey, Inc., New York, N.Y., traced the development of the *Dual-Duct System for Air Conditioning* from some of its earliest designs. Pressures and velocities used were shown to depend on the economics of the system, and the importance of volume control was emphasized. The showing of slides and a film completed the program. A rising vote of thanks was given for the informative presentation. • • • The speaker at a joint meeting of *ASRE* and the NORTH JERSEY Chapter of ASHAE was Albert Giannini, district manager, Carrier Corporation, New York, N.Y. Mr. Giannini, past president of the New York Chapter, spoke on *Multi-room Multi-story Air Conditioning,* describing the types of systems. He noted the cost of different systems and explained principles of design. • • • An interesting comparison of flooded and dry-type refrigeration chillers was given to a NORTHEASTERN OKLAHOMA Chapter audience by E. B. Cover, branch manager, Industrial Division, York Corp., subsidiary of Borg-Warner Corp. In his talk on *Why Precision Manufacturing Plants Are Air Conditioned,* Mr. Cover explained differences between 4-pass and 2-pass performance within the evaporator tubes, comparative functions of expansion valves and float valves, advantages and disadvantages of the 2 types of systems in terms of oil return, freezeup protection, gas flashing to precool refrigerant, and surging within evaporator. An active discussion followed the presentation. Previous to the address, J. D. Shaw displayed a short film on a new type of resistance electric-arc welding. • • • A forceful talk on house heating and cooling with warm air was given at a NORTHERN OHIO Chapter meeting by C. W. Nessell, industry consultant, Minneapolis-Honeywell Regulator Co., Mount Prospect, Ill. A lively question and answer period followed. • • • The *Control of Sound in Ducts* was the problem posed by J. W. Overend, sales engineer, Metal Products Division, Koppers Co., Inc., Baltimore, Md. As guest speaker at an OKLAHOMA Chapter meeting, Mr. Overend treated the problems of noise transmission in air-conditioning duct work. He discussed sound theory and methods of eliminating noise transmission. • • • Information on *Residential Air Conditioning—the Do's and the Don'ts* was presented to the ONTARIO Chapter by D. B. Thomas, general sales manager, Shipley Company of Canada, Ltd., Rexdale, Ontario, Canada. Mr. Thomas' talk contained a number of facts of great interest to the members and their guests. • • • The speaker of the evening at an OREGON Chapter meeting was L. L. Loper, Jr., manager, Vermiculite Contractors, Inc., Seattle, Wash. Mr. Loper spoke on the design and application of underground insulating pipe conduits. His talk was supplemented by slides and a display of insulators. • • • On the agenda at another Oregon Chapter meeting was a talk by Lewis Brooks, sales manager, Carrier Corporation, Seattle, Wash. His presentation on *Air Conditioning Systems for Multi-room Buildings* was devoted mainly to the single-duct primary system. Owning costs based on amortization period were discussed, as well as the technical aspects and engineering problems, and how to handle sensible and latent heat, humidification allowances for sun load, seasonal variation, changeover point winter cycle of operation, load balance summer cycle, and load balance winter cycle. Mr. Brooks' talk was enjoyed by all present. • • • An excellent field trip to the Bethlehem Pacific Coast Steel Co. was made by the members of the PACIFIC NORTHWEST Chapter. • • • PHILADELPHIA Chapter heard M. G. Rolland, chief mechanical engineer, Anderson-Nichols and Co., as their guest speaker. His selected subject was *Design Criteria and Construction Problems Involved in the Building of a Texas Tower (Radar-Warning Platform,* 120 *Miles off Atlantic Coast).* This was followed by a movie, *The Texas Towers.* • • • At a PITTSBURGH Chapter meeting, R. A. Danesi covered *Water Treatment for Cooling Towers, Spray Units, Closed Systems and Boilers.* After this program, the many questions asked by the members were capably handled by Mr. Danesi. • • • Slides exhibiting mechanical systems employed at the Air Force Academy were shown as part of an enlightening presentation given by Sam Sachs, chief of heating, ventilating and air conditioning, Skidmore, Owings & Merrill, Chicago, at a ROCKY MOUNTAIN Chapter meeting. • • • Considerable light on the subject of air conditioning in the tobacco industry was offered to his SOUTHERN PIEDMONT audience by Wilson Lamb, engineer, R. J. Reynolds Tobacco Co., Winston-Salem, N.C. The speaker also specifically treated the problem of air conditioning research laboratories. In summation he named 3 air-conditioning industry needs: reliability in equipment regardless of cost, more complete maintenance and instruction books, and periodic follow-up by representatives to make sure that their equipment is proving satisfactory. • • • A program on steam and its application was featured at a SOUTHWEST TEXAS Chapter meeting. The speaker was M. E. Staley, consulting mechanical engineer, San Antonio, Tex. His coverage included various systems: 1-pipe, 2-pipe, gravity, vapor, vacuum, and variations of vacuum systems. An enthusiastic question and answer session concluded the program. • • • The evolution of heating systems and some of the modern types in use today were discussed by Frank Gall, sales promotion manager, Bell & Gossett Co., Morton Grove, Ill. Speaking at a TOLEDO Chapter meeting, Mr. Gall mentioned some of the most common faults in the design and operation of hot water heating systems, together with methods of alleviation. The 3 general categories into which these fall were named by the speaker as air elimination, pump sizing, and compression tank location. • • • Enthusiastic reception was accorded a talk by N. M. Love, chief engineer, Wh. H. Singleton Co., Inc., Arlington, Va., before the WASHINGTON, D.C., Chapter. In his discussion of *High Velocity Air Distribution,* Mr. Love pointed out that such systems are definitely gaining prominence throughout the country and that many more can be expected in the Washington area. In order to have a satisfactory installation, the speaker emphasized, it is urgent that the architect, engineer, manufacturer and contractor work closely together from the very beginning of the planning stage through the entire construction. Mr. Love enumerated the 4 basic problems which he as a contractor faces: time table, field balancing and control, noise, and labor of installation. • • • Charles Saunders, representative, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., designated *The Four Freedoms of Electronic Control* for his WEST TEXAS Chapter audience. The talk was well received. • • • At another meeting of the West Texas Chapter, a film on unit ventilators was presented. • • • Donald Cousins, manager, merchandising department, Marley Co., Kansas City, Mo., spoke to the WISCONSIN Chapter on *Cooling Towers for Wisconsin.* Mr. Cousins defined the basic terms used in cooling tower work. He traced the development of cooling towers and pointed out some of the precautions which must be observed in their application. A lively question and answer period concluded the meeting.

Non-technical Programs

A presentation on *Bid Bonds and Performance Bonds* was given at a CENTRAL NEW YORK Chapter meeting, by David Templeton, superintendent, bond department, Aetna Casualty & Surety Co., Syracuse, N.Y. Mr. Templeton discussed the precise meaning of a bid and performance bond, pointing out that of itself it added nothing to the contract already signed between owner and contractor, but simply backed the credit of the contractor with the financial means of the surety company. An enthusiastic discussion period took place at the end of the talk, centering chiefly on the recourse available to material suppliers when not reimbursed by the contractor. • • • At a meeting of the INDIANA Chapter, with the members of the PURDUE UNIVERSITY Student Branch in attendance, Jack Clarke, vice president and general sales manager, Van Ausdall and Farrar, Inc., Indianapolis, Ind., reviewed the *Mutual Problems of Salesmen, Engineers, Management, and Consultants.* Mr. Clarke's highly informative address was greatly enjoyed by his audience, and was of particular interest to the attending students who had been studying the problems of communication within companies. Previous to the main program, the coffee speaker, Ferdinand Jehle, secretary, Indiana State Board of Registration for Professional Engineers & Land Surveyors, Indianapolis, Ind., told about *Engineering Today.* • • • A film entitled *The Kitimat Story,* shown to a MANITOBA Chapter audience, was well received by the members and their guests. • • • NEBRASKA Chapter members learned about *Patents and the Engineer.* H. A. Sturges, attorney, spoke of the advantages of obtaining patents and outlined the procedure involved. He discussed royalty and partner agreements. • • • W. P. Wells, program chairman of the SOUTHERN PIEDMONT Chapter, presided over an open discussion from the

floor regarding suggestions on projects for special activities committee consideration. Among the numerous suggestions for special projects were those made by W. A. Graham, A. W. Bainbridge, L. F. Lawrence, Mr. Wells, C. R. Harris and J. G. Hopping, Jr. • • • Pres. J. F. Guest greeted the guests and the wives of chapter members who attended the first annual TOLEDO Chapter dinner dance. • • • A general discussion on means of program improvement was opened by Pres. C. G. Conaway, Jr., at a VIRGINIA Chapter meeting. • • • *Teacher Recruitment* was the subject of an illuminating talk by Zeph Marsh, Minneapolis-Honeywell Regulator Co., at a meeting of the WEST TEXAS Chapter.

Purdue Students at Chicago

A group of 37 members of the Purdue University Student Branch, accompanied by Professors Robert Olsen and F. B. Morse, faculty advisor, attended the Society's Annual Meeting in Chicago. The students had the opportunity to attend the technical sessions of their choice and to visit the Exposition. During the ride back to West Lafayette by chartered bus, the students' comments of approval expressed universal enjoyment of the trip.

Cited and Selected

Pres. J. B. Hoaglund, ARIZONA Chapter, appointed E. P. Maxwell, A. J. Nelesen, Jr., and T. Sigmundson on the committee to count ballots for the election of a nominating committee. The election results named F. A. Anderson, Hans Sommers and J. J. Cosgrove. • • • Following a motion from the floor, Secy. C. E. McCaffray, BALTIMORE Chapter, was instructed to cast a ballot for the 5 members of their nominating committee: A. M. Norris, G. B. Priester, C. E. Rice, Jr., E. H. Taze and R. W. Pentecost. • • • Elected to BLUEGRASS Chapter's nominating committee were L. J. O'Dell, John Sutter and C. J. Roberts. Mr. Sutter was appointed temporary chairman. Discussion on a roster to be compiled and distributed to all members of the chapter resulted in the appointment of O. J. Hill to realize the completion of the proposed project. • • • BRITISH COLUMBIA Chapter's president, D. W. Thomson, announced the appointment of the following committees: *Auditing*—S. W. Welsh, R. D. Hale and R. L. Rodway; and *Nominating*—S. C. Gale, M. E. Minaker and R. C. Tufts. • • • All 11 past presidents of the CENTRAL NEW YORK Chapter were introduced at their meeting by J. W. Stevens. • • • C. V. Bankston, past president of the DELTA Chapter (1954-55), presented Past Pres. W. B. Martin, Jr. (1955-56) with the Delta Chapter past presidents' certificate. • • • Following the resignation of J. H. Brooks, secretary, EL PASO Chapter, M. W.

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Schlessinger was elected to fill the vacancy. • • • C. W. Blodgett, reporting for Chairman C. W. Johnson of the board of tellers, announced the names of the 7 candidates elected to the nominating committee of the ILLINOIS Chapter: H. E. Anderson, M. J. Bamond, H. G. Gragg, E. P. Heckel, Jr., Herbert Kreisman, L. O. Paul and E. R. Teske. • • • A. W. Edwards brought greetings from the Cincinnati Chapter to an INDIANA Chapter meeting. • • • An auditing committee consisting of W. R. Elam, R. E. Bozlee and S. A. Thomas was selected by Pres. Max Tonn, INLAND EMPIRE Chapter. W. N. Pauley introduced the chapter's choice for Engineer of the Year, K. M. Wood. • • • The chairman of the attendance committee, KANSAS CITY Chapter, E. M. Hopkins, presented awards to G. A. Moore and Paul Gebhardt. Pres. R. M. Spencer announced the appointment of a nominating committee staffed by G. H. Stoffer, D. M. Allen, R. B. Mason, and the president, with A. S. Hurt, Jr., as chairman. • • • P. L. Charles, of the MANITOBA Chapter, was the recipient of a past president's pin which was presented by G. T. Christie, who outlined Mr. Charles' career as a lifetime of distinguished service in the field of heating, ventilating and air conditioning. In his role as membership chairman, Mr. Christie named W. L. Algie, H. T. Lowe, D. S. Swain and A. Leiterman as assistants. • • • MIAMI VALLEY Chapter election results were as follows: *President*—L. P. Brehm, Jr.; *Vice President*—R. B. Walcott; *Secretary*—N. O. Mitchell; *Treasurer*—W. H. Fogarty; *Board of Governors*—J. J. Bechtol, R. J. Perkins, D. E. Tullis and C. D. Weaver, Jr. J. B. Rishel, as past president, became the fifth member of the board of governors. • • • Pres. E. T. Erickson, MINNESOTA Chapter, announced that the board of governors had appointed J. S. Locke as general chairman, Committee on Arrangements, for the 1958 Semi-Annual Meeting of the Society to be held in Minneapolis, Minn. • • • Two sets of committee appointments were presented to the NEW YORK Chapter members by Pres. J. B. Hewett. R. L. Stinard will act as chairman of the auditing committee, with H. W. Demuth and R. M. Kluger as members. The board of tellers of election will be J. P. Lyon, chairman, F. A. Fideli and Alfred Greenberg. • • • The nominating committee of the NORTHERN OHIO Chapter for the coming year was reported by Pres. H. R. Canoyer. The committee will consist of D. E. Mannen, D. L. Taze and J. E. Wilhelm. • • • Pres. W. R. Norte notified the OREGON Chapter that a committee had been formed to cooperate with the Oregon Building Congress regarding the Museum of Science and Industry. Manning the committee will be J. W. Wallace, Jr., C. W. Timmer and G. G. Van Alst, chairman. Unanimously elected as Oregon Chapter's new slate of officers for the coming year were: *President*—W. B. Hayes; *Vice President*—Keith Kruchek; *Secretary*—W. S. Cooper; *Treasurer*—G. H. Lord; *Board of Governors*—W. R. Norte, T. E. Taylor and E. S. Constant. • • • The president of the PACIFIC NORTHWEST Chapter, L. F. Christofferson, discussed the new rosters which were sent to all chapter members and gave full credit to E. W. Triol for the production. • • • J. A. Rice, president of SOUTHERN PIEDMONT Chapter, commenting on the number of members at recent chapter meetings, attributed the good attendance to the work of the program chairman, C. E. Petty, and the excellent speakers and programs he had obtained. As outgoing president, Mr. Rice was presented a past president's pin and a gavel by G. C. Garrett. • • • Congratulations were extended by Pres. J. F. Guest, TOLEDO Chapter, to G. R. Munger and Gershon Meckler for their window display that won first prize during Engineers Week. R. C. Moorhead expressed his appreciation for being selected to represent the chapter as Engineer of the Year. • • • R. B. Carow, chairman of the tellers committee of the WEST TEXAS Chapter, announced the results of their election: *President*—H. L. Mayes; *Vice President*—V. B. Garry; *Secretary*—W. R. Anthony; *Treasurer*—C. P. Houston; *Board of Governors*—R. L. Mason and J. C. Wharton. President Wharton thanked the various committee members and chairmen, and was praised in turn by the incoming president, Mr. Mayes. Mr. Carow, D. G. Halley and F. J. Lindsey were appointed to the auditing committee. Later, B. C. Melanson was elected as member of the Chapters Regional Committee, with T. F. Sartor as alternate. • • • Two appointments to the Gustus L. Larson committee, I. J. Rossiter and Bert Fredericksen, were announced by Pres. H. K. Forfar, WISCONSIN Chapter. Also appointed were O. A. Trostel, A. S. Krenz and Mr. Rossiter as members of a nominating committee.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 119 men who are candidates for membership or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before May 31, 1957, of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

Note: **Advancement* *†Reinstatement*

Arkansas *(Region 6)*

LEGATE, J. R., JR., Design Draftsman, Erhart, Eichenbaum, Rauch & Blass, Little Rock.

THOMPSON, W. W., Mfrs. Repr., Little Rock.

California *(Region 4)*

CHRISTOPH, CHRISTO, Design Engr., Pereira and Luckman, Los Angeles.

SHROFF, PETER, Chief Dvlpt. Engr., Fluor Products Co., Whittier.

YOSHPE, DANIEL, Mech. Engr., L. A. O'Meara, Sacramento.

Colorado *(Region 3)*

COWDEN, B. E., Engr. & Sales Mgr., Wholesale Plumbing, Heating & Air Conditioning, Pueblo.

Connecticut *(Region 1)*

MINGES, J. S., Partner, Marchant & Minges, West Hartford.

Illinois *(Region 2)*

ACIERNO, T. G.*, Engr., Corn Products Refining Co., Chicago.

BAIRD, V. R., Tech. Service Engr., Powers Regulator Co., Skokie.

BAKER, J. E., Project Engr., Kroeschell Engineering Co., Chicago.

BLOCK, JEROME, Project Engr., H. S. Kaiser Co., Chicago.

CHERRY, D. G., Sales Engr., Johnson Service Co., Harvey.

HENKE, H. R., Marketing Mgr., Bell & Gossett Co., Morton Grove.

KEHM, W. G., Supvsr., Htg. & A-C., Crane Co., Chicago.

MILLER, A. G., Engr., Kroeschell Engineering Co., Chicago.

NOBLE, D. H., Elec. Research Engr., Chicago, Rock Island & Pacific Railroad, Chicago.

SALMON, J. E., Dist. Sales Mgr., Carrier Corporation, Chicago.

SHUMAN, EDWIN, Chief Mech. Engr., Robert E. Hattis Engineers, Inc., Chicago.

WORTH, W. H., Mgr., Htg. Dept., Sarco Co., Inc., Chicago.

Indiana *(Region 2)*

SHUTTLEWORTH, RILEY†, Owner, Indianapolis.

Iowa *(Region 3)*

BROWNE, J. F., Engrg. Draftsman, Louis C. Kingscott & Assoc., Davenport.

MURPHY, T. D., Sales Engr., The Trane Co., Davenport.

Kansas *(Region 3)*

RAPP, G. A.†, Br. Mgr., General Controls Co., Wichita.

Kentucky *(Region 5)*

HOCHSTRASSER, R. L., Chief Mech. Engr., L. W. O'Donnell & Assocs., Louisville.

Maryland *(Region 5)*

JUISTER, C. G., Vtg. Design Engr., The Maryland Shipbuilding & Drydock Co., Baltimore.

VELTRE, A. P., Mech. Design Engr., The Maryland Shipbuilding & Drydock Co., Baltimore.

Massachusetts *(Region 1)*

DOW, J. A., Mech. Engr., Cleverdon, Varney & Pike, Boston.

HARRINGTON, A. V., Asst. Dir., Massachusetts Dept. of Public Health, Division of Hospitals, Boston.

LEVINGS, W. S., Sales Engr., The Trane Co., Boston.

WEST, G. E. JR., Engr., Stone & Webster Engineering Corp., Boston.

Michigan *(Region 2)*

BESEMER, T. E., Sales Engr., Johnson Service Co., Ferndale.

HAMMOND, R. H., Repr., Minneapolis-Honeywell Regulator Co., Detroit.

JOHNSON, N. M., Vice Pres., Industrial Sales Div., Roy M. Snypp, Inc., Detroit.

KEENE, N. C., Sales Engr., Weil-McLain Co., Ann Arbor.

SCHEFF, E. C., Sr. Design Draftsman, O'Dell, Hewlett & Luckenback Assocs., Birmingham.

MICKELSEN, J. A., Mech. Engr., King & Park, Inc., Birmingham.

Minnesota *(Region 3)*

MAHANNA, H. J., Htg. Dept. Mgr., Crane Co., Minneapolis.

Mississippi *(Region 5)*

WARRINER, S. R., JR., Sales Engr., Walter Cooke, Jackson.

Missouri *(Region 3)*

GRATNY, B. R., Engr., Natkin & Co., Kansas City.

Lambert, L. A., Chief A-C. Branch, U. S. Government, Kansas City.

Scott, L. A., Sales Engr., Westinghouse Electric Corp., Sturtevant Div., St. Louis.

Sneller, A. J.*, Partner, J. R. De Rigne & Assocs., Kansas City.

Van Dierendonck, Jack. Sales Engr., American Standard, Kewanee Boiler Div., Kansas City.

New Jersey *(Region 1)*

Adler, A. R., Supvsr., Field Service, General Electric Co., Bloomfield.

Bohman, R. E., Sales Engr., Johnson Service Co., Union.

Hoke, D. G., Pres., Flowprocess equipment, inc., Summit.

Kiefer, C. N., Sales Engr., Johnson Service Co., Union.

Poh, G. C., Sales Engr., Minneapolis-Honeywell Regulator Co., Union.

New Mexico *(Region 6)*

Blue, H. N., Owner, Goodrich Roofing Co., Albuquerque.

Classen, Leo*, Staff Member, Mech. Engrg., Los Alamos Scientific Laboratory, University of California, Los Alamos.

New York *(Region 1)*

Alvord, A. M., Jr., Pres., Alvord and Swift, New York.

Burwell, J. T., Jr., Dir. of Research, American-Standard Corp., New York.

Caso, R. J., Mech. Engr., Parsons, Brinckerhoff, Hall & MacDonald, New York.

Eaton, B. E., Sales Engr., L. J. Wing Mfg. Co., Inc., New York.

Kane, C. J., Mgr., John J. Nesbitt, Inc., Syracuse.

Mance, J. R., Exec. Vice Pres., Mance Corp., New York.

McKay, J. W., Constr. Management Engr., U. S. Air Force, 7th Air Div., New York.

Segner, M. H. †, Cons. Engr., New York.

Waterbury, A. B., Chief Engr. & Asst. Vice Pres., Walter Kidde Constructors, Inc., New York.

North Carolina *(Region 5)*

Bonkemeyer, L. W., Repr., Crane Co., Greensboro.

Russell, R. W., Jr.*, Mech. Engr., Lashmit, James, Brown & Pollock, Winston-Salem.

Ohio *(Region 2)*

Barber, E. E., Repr., Worly Plumbing Supplies, Delaware.

Bolster, A. L., Owner, Arthur L. Bolster Co., Toledo.

Claspill, C. B., Jr., Sales Engr., M. P. Wilkins Co., Toledo.

Crotser, W. R., Repr., Graybar Electric Co., Inc., Toledo.

Fotoples, C. L., Installation, Hausman Steel Co., Toledo.

Frauenfelder, F. A., Sales Engr., American Blower Div., Cincinnati.

Garberson, C. L., Technician, Johnson Service Co., Toledo.

Harbison, S. G., Jr. Engr., The Austin Co., Cleveland.

Hull, A. S., Exec. Secy., Air-Conditioning & Refrigeration Wholesalers, Columbus.

Johnson, R. G., Engr., Hausman Steel Co., Toledo.

Keller, R. W., Estimator, Sheet Metal Engineering, Cincinnati.

Kerschbaum, H. L., Jr., Mech. Systems Engr., Owens Illinois, Toledo.

Nickey, J. M.†, Asst. Mech. Engr., Frankenberger, Junker & Lensky, Cincinnati.

Smiley, A. S., Sales Engr., York Corp., Cincinnati.

Timm, R. F., Sales Engr., Johnson Service Co., Cincinnati.

Oklahoma *(Region 6)*

Yandell, O. G., Jr., Sales Engineer, O'Connor Oklahoma Co., Inc., Tulsa.

Pennsylvania *(Region 1)*

Braun, E. P., Jr., Sales Engr., Johnson Service Co., Pittsburgh.

Pfister, R. J., Service Mgr., Johnson Service Co., Pittsburgh.

Smetak, G. E.*, Sales Engr., Johnson Service Co., Pittsburgh.

Tennessee *(Region 5)*

Brooks, L. W., Repr., Ferguson Equipment Co., Knoxville.

Texas *(Region 6)*

Brown, R. E., Constr. & Service Engr., Carrier Corporation, Dallas.

Burt, William, Designer, Herbert Brasher & Assocs., Lubbock.

Cohen, L. P., Branch Engr., Engineered Air Balance Co., Inc., Houston.

Katten, E. M., Asst. Mgr., United Electric Co., Wichita Falls.

Kinser, C. V., Mech. Engr., U. S. Air Force, Bergstrom Air Force Base, Austin.

Mersereau, J. G., Secy-Treas., Plumbing Enterprise, Inc., Houston.

Salisbury, C. D., Draftsman, R. L. Jenkins, Houston.

Schneider, K. E., Sales Engr., Dunham-Bush, Inc., Dallas.

Smith, A. H.*, Mech. Engr., Roscoe Dewitt, Dallas.

Vermont *(Region 1)*

Pleu, A. R., Htg. & A-C. Engr., Charles S. Millar & Son Co., St. Johnsbury.

Virginia *(Region 5)*

Pierce, L. L., Constr. Mgr., Wm. H. Singleton Co., Inc., Arlington.

Washington *(Region 4)*

Patten, C. M., Sales Engr., Minneapolis-Honeywell Regulator Co., Seattle.

Person, H. G., Sr. Draftsman, Austin Assocs., Seattle.

Thorn, Fred†, Cons. Engr., May & Triol, Seattle.

Wisconsin *(Region 2)*

Cook, H. D., Educational Dir., Johnson Service Co., Milwaukee.

Canada *(Region 7)*

Bell, C. E., Engr., Beaver Engineering Co., Toronto, Ont.

Boulay, J. P., Prof. Engr., Garnier, Inc., Quebec, Que.

Cochrane, J. D., Service Supt., John Ritchie, Ltd., Toronto, Ont.

Cowl, G. I., Chief Draftsman, Tulloch & Stephen, Ltd., Toronto, Ont.

Dagenais, Marcel, Sales Engr., American Standard Products (Canada), Ltd., Montreal, Que.

Desmarteau, Paul, Technician, DuPont of Canada (1956), Ltd., Montreal, Que.

Haas, O. F., Design Engr. & Office Mgr., Libby Engineering, Ltd., Toronto, Ont.

Harvie, A. S., Mech. Estimator, Canadian Comstock Co., Ltd., Edmonton, Alta.

Jelich, G. D., Design Draftsman, W. H. Bonus, Toronto, Ont.

LeDuc, J. G., Sales Engr., Dunham-Bush (Canada), Ltd., Ottawa, Ont.

L'Esperance, R. J., Proj. Supvsr., Defense Construction (1951) Ltd., Quebec, Que.

Roe, Joseph, Mech. Estimator, Canadian Comstock Co., Edmonton, Alta.

Ross, J. M., Branch Mgr., Ross Engineering of Canada, Ltd., Vancouver, B.C.

Stethem, W. C., Supvsr. Research & Dvlpt., S. A. Armstrong, Ltd., Toronto, Ont.

Trethewey, R. J., Contract Control, Canadian Comstock Co., Ltd., Winnipeg, Man.

Turcotte, Gerard, Cons. Engr., Gilles Sarault, Quebec, Que.

Zarnett, B. H.*, Chief Engr. & Owner, Air Comfort Engineering Co., Toronto, Ont.

Arabia

Ashraf, Muhammad, A-C. Foreman, Murad Yousuf Behbehani, Kuwait.

Belgium

Marcq, H. B. F., Cons. Engr., Brussels.

England

Abbey, K. W., Cons. Engr., Kingswear.

Lebanon

Wybro, J. C., A-C. & Refrig. Repr., Worthington Corp., Beirut.

Singapore

Dickerson, Dennis, Repr., Condair Engineering, Ltd., Singapore.

South Africa

Conlan, P. J., Sales Mgr. & Engr., Matthew Hall (PTY), Ltd., Johannesburg.

Venezuela

Fleming, B. W.*, Mgr., A-C. & Commercial Refrig. Dept., La Casa Electrica, Maracaibo.

OBITUARIES

ALBERT V. STANIFORTH
Hull, England

Albert Victor Staniforth, 57, consulting engineer, A. V. Staniforth & Partners, Hull, Yorks, England, died recently.

Mr. Staniforth, who attended Hull Technical College, in his early years was employed in power station design and installation. Following nine years as chief draftsman, Sculcoates Power Station, Hull, he was appointed chief construction engineer in 1932. He started as a consulting engineer in 1946, specializing in heating and ventilating installations, as well as electrical and other mechanical work.

In addition to holding Society membership, Mr. Staniforth was a member of the *Institution of Mechanical Engineers* and the *Institution of Structural Engineers.* As an inventor, he held patents on various special steel flooring and flue linings. Surviving is his wife.

KISER A. STEPHENSON
Atlanta, Ga.

Kiser A. Stephenson, 63, president, Stephenson Co., Atlanta, Ga., died on March 18. He was a member of the Society since 1941.

For twenty-nine years Mr. Stephenson directed the plumbing and heating contracting firm founded by his father. Among his projects were the State Office Building, Atlanta, and Georgia Hall, Warm Springs Foundation, Warm Springs, Georgia.

Having attended Georgia Institute of Technology, he was a member of the Georgia Tech Club. He also held membership in the *Society of American Military Engineers, Georgia Engineering Society, American Society of Sanitary Engineers* and the Atlanta Athletic Club. He was a member of the Druid Hills Baptist Church. He is survived by his wife.

(For most recent listing of Society Officers see Frontispiece, JOURNAL SECTION)

Council Committees; General and Special Committees; Nominating Committee

Of the *Council Committees*, only the Program and Papers Committee has a subcommittee and its personnel is listed here. All *General and Special Committees* personnel are listed except the Technical Advisory Committees. See note under *General Committees* covering names of personnel of the Technical Advisory Committees.

Council Committees

Executive: E. R. Queer, Chairman; A. J. Hess, C. H. Pesterfield.

Finance: Walter A. Grant, Chairman; J. N. Livermore, P. J. Marschall, C. H. Pesterfield (Ex Officio).

Membership: J. H. Ross, Chairman; D. M. Mills, W. O. Stewart.

Program and Papers: John Everetts, Jr., Chairman; W. G. Hole, P. N. Vinther.

Program Subcommittee: Walter A. Grant, Chairman, 300 S. Geddes St., Syracuse 1, N.Y.; D. L. Angus, 25 Bayview Wood, Toronto, Ont., Canada; W. P. Chapman, 3816 N. 40th St., Milwaukee 16; L. F. Christofferson, 425-1411 Fourth Ave. Bldg., Seattle 1; C. W. DeLand, 6138 N. Clark St., Chicago 26; B. L. Evans, 4030 Chouteau (Rm. 212), St. Louis 10; C. B. Gamble, 635 Commercial Pl., New Orleans 12; A. S. Gates, Jr., Dept. of Navy, Bureau of Ships, Washington 25; J. B. Graham, 490 Broadway, Buffalo 5; Linn Helander, Dept. of Mechanical Engrg., Kansas State College, Manhattan, Kans.; Fred Janssen, 1123 W. Third Ave., Denver; G. A. Linskie, 2608-A Inwood Rd., Dallas 19; P. J. Marschall, 14th & Sheridan, No. Chicago; W. O. Stewart, 615 N. Alvarado St., Los Angeles 26; H. E. Ziel, 345 New Center Bldg., Detroit.

Regions Central: A. J. Hess, Chairman; John Everetts, Jr. (1); P. J. Marschall (2); A. B. Algren (3); W. O. Stewart (4); C. B. Gamble (5); D. M. Mills (6); W. G. Hole (7).

General Committees

Admission & Advancement: F. H. Buzzard, Chairman (one year); Roswell Farnham (two years); C. S. Koehler (three years).

Publication: W. J. Collins, Jr., Chairman (one year); J. W. May (two years); F. H. Faust (three years).

Guide: M. W. Keyes, Chairman; H. W. Alyea, W. P. Chapman, R. C. Chewning, J. R. Duncan, R. A. Gonzalez, N. B. Hutcheon, R. L. Maher, D. W. Nelson, H. A. Lockhart (Ex Officio).

Charter & By-Laws: J. Donald Kroeker, Chairman (one year); J. C. Fitts (two years); J. S. Locke (three years).

F. Paul Anderson: E. R. Queer, Chairman; John Everetts, Jr., John W. James, A. J. Nesbitt, F. B. Rowley.

Chapters Regional Committees: The list of members and alternate members for the 7 Chapters Regional Committees appears in the April 1957 JOURNAL SECTION, p. 176.

Committee on Research: H. A. Lockhart, Chairman; E. F. Snyder, Jr., Vice Chairman.

Three years: D. D'Eustachio, E. S. Howarth, H. R. Limbacher, E. F. Snyder, Jr., J. I. Trimble.

Two years: F. H. Faust, F. K. Hick, M.D., R. C. Jordan, H. A. Lockhart, Arthur Nutting.

One year: R. C. Chewning, W. S. Harris, N. B. Hutcheon, B. H. Jennings, P. H. Yeomans.

Technical Advisory Committees: These are subcommittees of the Committee on Research. Last published list appears in January 1957 JOURNAL SECTION, p. 218.

Public Relations: B. W. Farnes, Chairman; T. V. Johnson, F. W. Brundage, J. H. Fox, E. K. Wagner.

Standards: K. T. Davis, Chairman; C. B. Gamble (one year); A. B. Algren, A. B. Newton (two years); P. N. Vinther, Albert Giannini (three years).

The Standards Committee appoints special subcommittees to prepare new standards, to revise existing standards, or to consider questions arising with regard to the need for new standards. At present there are 6 such subcommittees as follows:

ASHAE Committee on Code for Testing and Rating Gravity Type Roof Ventilators: Linn Helander, Chairman; G. C. Breidert, F. N. Calhoon, R. B. Engdahl, W. V. Hukill, J. P. Johnson, K. E. Robinson, F. B. Rowley, L. J. Shumaker.

ASHAE Committee on Code for Testing and Rating Heavy Duty Furnaces: E. K. Campbell, Chairman; Bowen Campbell, A. P. Loeb, C. J. Low, W. J. MaGirl, B. F. McLouth, F. L. Meyer, L. G. Miller, A. A. Olson, H. A. Pietsch, O. J. Ress, H. A. Soper.

ASHAE Committee on Safety Regulations for Heating, Ventilating and Air Conditioning Systems: G. P. Nachman, Chairman; F. H. Buzzard, H. W. McKenzie, B. F. McLouth, C. H. Randolph.

Committee for Revision of ASHAE Standard Code for Testing and Rating Return Line Low Vacuum Heating Pumps: W. M. Wallace, II, Chairman; H. E. Adams, H. S. Beam, A. H. Church, L. M. Nechine, E. G. Powell, A. O. Roche, Jr., D. W. Whittington.

Joint Committee on Standards for Comfort Air Conditioning: W. L. Fleisher, Chairman; (ASHAE) O. W. Armspach, A. C. Buensod, C. C. Cheyney; (ASME) C. F. Kayan; (ASRE) F. H. Faust, C. F. Holske, S. P. Soling; (ARI) J. A. Gilbreath, R. A. Gonzalez; Alternate: G. S. Jones, (U.S. Public Health Service) W. C. Cooper, M.D.; At Large: M. K. Fahnestock, P. J. Marschall, G. E. May, A. B. Newton; (Medical Profession) W. J. McConnell, M.D.

Minimum Ventilation Requirements for Air Conditioned Spaces: Albert Giannini, Chairman; C. B. Gamble, R. A. Gonzalez, W. J. McConnell, M.D., R. J. Salinger, H. G. Strong.

Special Committees

AAAS Representative: Walter A. Grant.

ASHAE-AIA Committee on Cooperation: John E. Haines, Chairman; C. B. Gamble, John Everetts, Jr., H. C. Hoffmann, R. J. Salinger.

ASHAE-ASRE Committee on Cooperation: ASHAE Representatives — C. B. Gamble, L. N. Hunter, E. R. Queer. **ASRE** Representatives — Cecil Boling, A. J. Hess, H. F. Spoehrer.

Building: A. J. Hess, Chairman; M. F. Blankin, L. N. Livermore, P. J. Marschall, A. J. Offner, R. A. Sherman.

Engineers' Joint Council: P. B. Gordon and E. R. Queer (ASHAE Representatives).

Exposition: E. N. McDonnell, Chairman; John E. Haines, L. N. Hunter.

Guide Advisory: C. E. Price, Chairman; R. E. Cherne, J. C. Fitts, Albert Giannini, J. H. Ross.

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Gustus L. Larson Award: L. C. Plaehn, Chairman; P. D. Gayman, Co-Chairman; B. M. Kluge, Secretary; Bert Fredericksen, F. W. Goldsmith, F. J. Nunlist, Jr., I. J. Rossiter.

Long-Range Planning: John E. Haines, Chairman; E. L. Crosby (one year); John Everetts, Jr., L. N. Hunter (two years); John W. James, J. Donald Kroeker (three years).

NRC—National Academy of Sciences, Div. of Engrg.: L. E. Seeley.

Nuclear Energy Engineering: R. A. Sherman, Chairman; W. F. Friend, Walter A. Grant, L. N. Hunter, H. A. Lockhart (Committee on Research).

Nominating Committee

Region	Member	First Alternate	Second Alternate
1	C. W. Stone*	W. C. Kruse, Jr.*	E. K. Wagner*
2	H. G. Gragg*	John Richmond*	D. S. Falk*
3	J. S. Locke*	Fred Janssen*	D. M. Allen*
4	R. M. Stern*	H. B. Nottage*	L. F. Christofferson*
5	J. S. Burke*	G. B. Priester*	F. W. Bull*
6	G. A. Linskie*	G. H. Meffert*	G. T. Donceel*
7	D. L. Angus*	A. C. Martin*	G. C. Davis*
3	B. L. Evans†		
4	J. Donald Kroeker†		
6	Reg. F. Taylor†	G. C. F. Asker† (5)	R. L. Stinard† (1)
7	E. K. Cumming†		

†Selected by Council. *Selected by Chapters Regional Committees.

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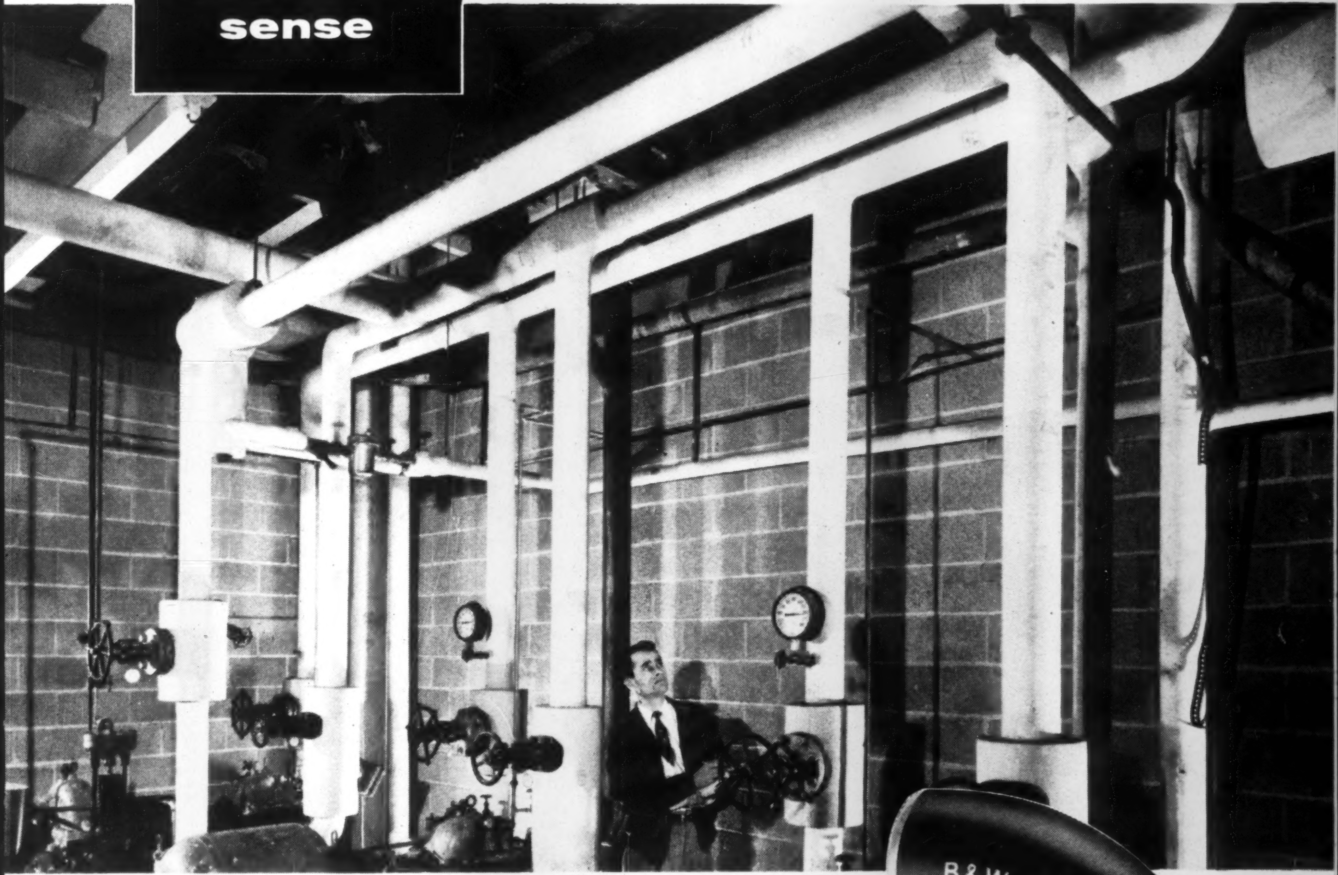

B&W 6" SCH. 40 WPB CII

THE engineer who specified B&W Seamless Welding Fittings on this boiler job knew what he was doing. He realized the system would have to be permanent and leakproof for many years to come. He also realized how much time and money could be saved in fabrication, and, of course, insulation. Therefore, it was only natural that he chose welded connections since they actually become part of the piping system and are as strong, or stronger than the pipe itself. Pipes nest closer and the overall system is considerably lighter.

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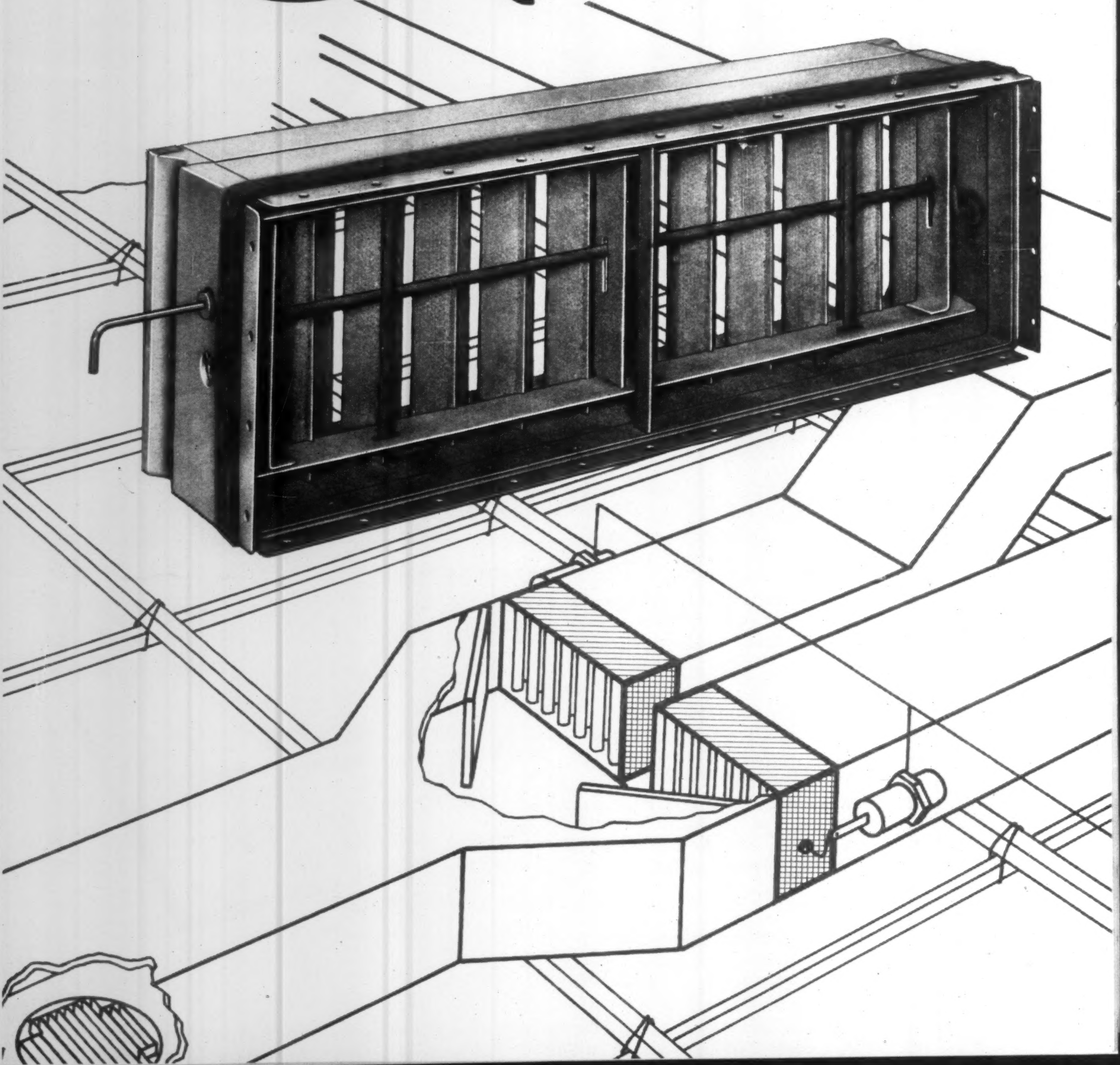
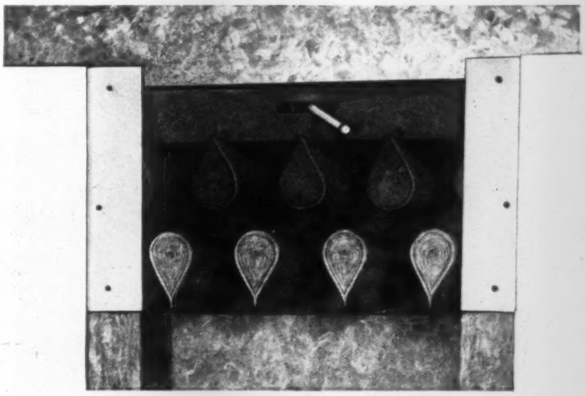
. . . a *quiet* pressure

TYPE PRV



reducing valve for use in both high and low velocity air distribution systems



Tuttle & Bailey Type PRV PRESSURE REDUCING VALVE has wide application as a balancing damper in either the supply or return portions of high and low velocity systems. Unlike most dampers that generate noise when pressure drops of .15″ H_2O are taken across them, the PRV is designed to incorporate airfoil characteristics, permitting *quiet* handling of pressure drops up to 3.0″ H_2O. To trap and absorb sound energy, the valve vanes are constructed of formed metal shapes, packed with acoustical insulation, and flock coated. The PRV comes in a wide range of standard sizes in one-piece construction up to 36″ x 16″.

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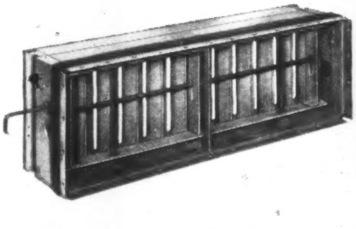
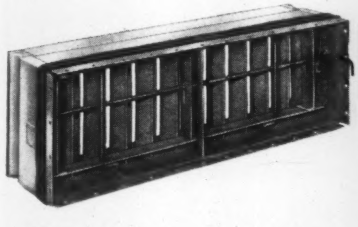
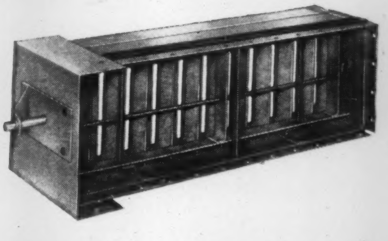


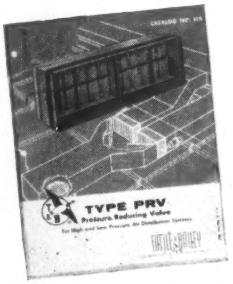
Manual Side Operation



Manual Face Operation



Arranged for Automatic Operation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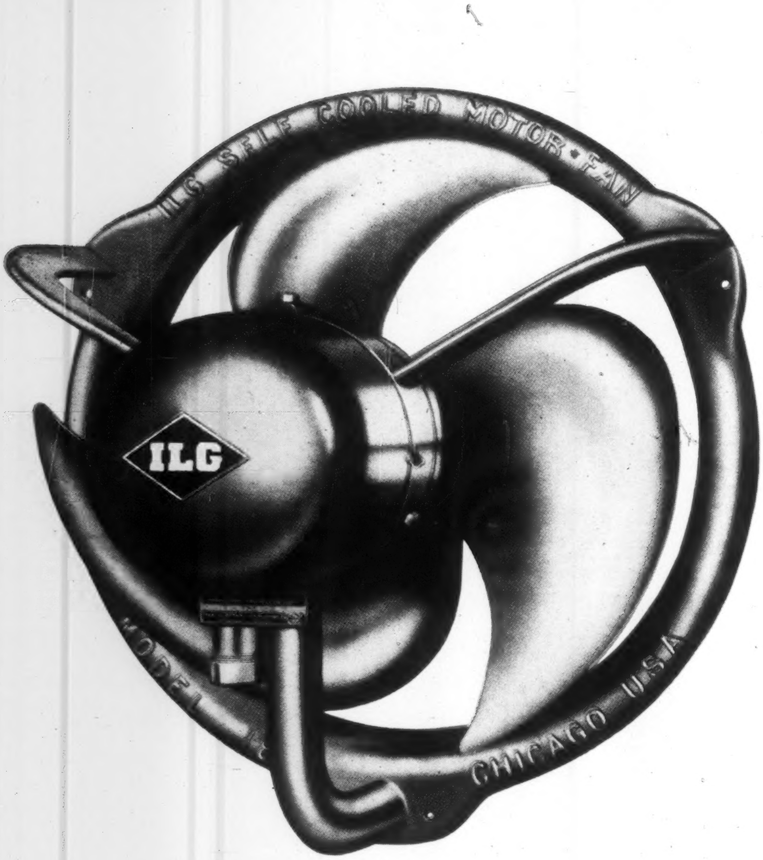

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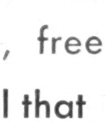

ANNOUNCING

the first major improvement in generator design in 25 years

New Thor generator powering a Thor 7¼" SpeedSaw hastens construction of the new Congress Street Expressway in Chicago.

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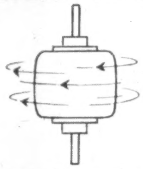
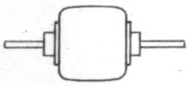


Entire weight of generator armature supported by the tubular frame. Engine and main bearing turn the armature—do not support it. Generator spins best on vertical axis—lasts longer.



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This handy, compact power plant—available in AC and DC models—is the real answer to the builder or contractor who needs a rugged, portable power source. Check these features, then check your Thor distributor for a demonstration. • **Revolutionary design—vertical shaft engine • Light weight—95 lbs. Strong tubular framework protects unit, assures handling ease • Heavy duty automatic rewind starter—easily removable for repair. Off-on toggle-type switch. No shock danger • Drip-proof construction—keeps fuel and moisture from entering generator • No-creep—stays put while running, yet slides easily when moved.** Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

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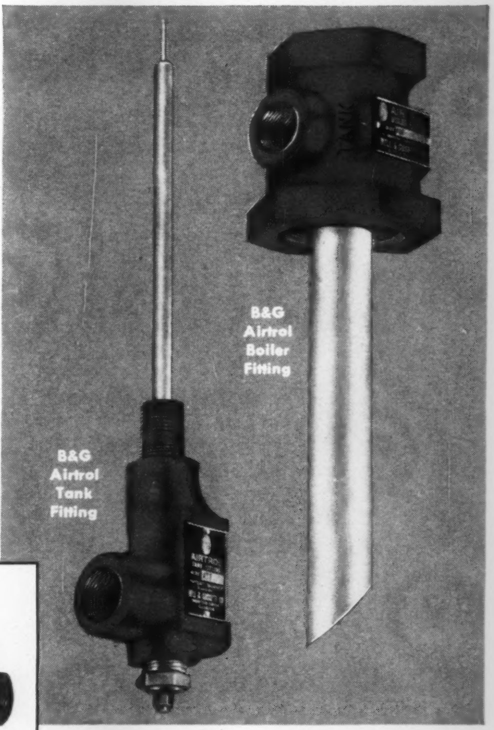
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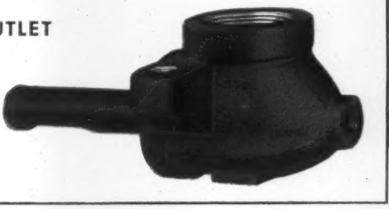
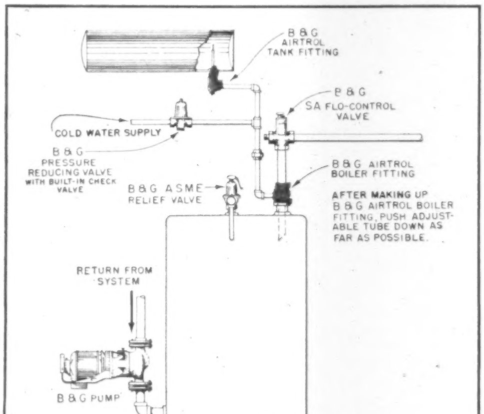
For complete information send for Bulletin No. HM-456.

NEW B&G AIRTROL SIDE OUTLET BOILER FITTING

This latest addition to Airtrol System equipment is made in four sizes to fit a wide range of side outlet boilers.

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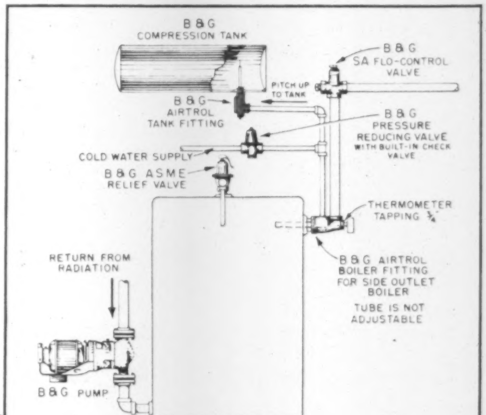
REDUCING VALVE
WITH BUILT-IN CHECK
VALVE
B & G ASME
RELIEF VALVE
B & G AIRTROL
BOILER FITTING
AFTER MAKING UP B & G AIRTROL BOILER FITTING, PUSH ADJUSTABLE TUBE DOWN AS FAR AS POSSIBLE.
RETURN FROM
SYSTEM
B & G PUMP

B&G Airtrol System installed on top outlet boiler.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B & G
SA FLO-CONTROL
VALVE
PITCH UP
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PRESSURE
REDUCING VALVE
WITH BUILT-IN CHECK
VALVE
COLD WATER SUPPLY
B & G ASME
RELIEF VALVE
THERMOMETER
TAPPING ¾"
RETURN FROM
RADIATION
B & G AIRTROL
BOILER FITTING
FOR SIDE OUTLET
BOILER
TUBE IS NOT
ADJUSTABLE
B & G PUMP

Installation of B&G Airtrol System on side outlet boiler.

International headquarters for information on the cure of air troubles in hot water heating systems of any size —cottage to skyscraper.

BELL & GOSSETT
COMPANY
Dept. EV-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong Ltd.,
1400 O'Connor Drive, Toronto 16, Ontario, Canada

Where cost and comfort count...

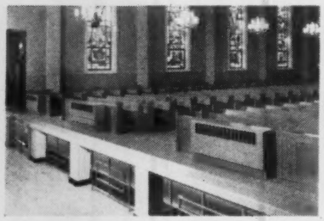
choose MODINE CABINET UNITS

And you can cut space needs 27%

VERSATILITY and low-cost performance make Modine cabinet units ideal for heating and ventilating commercial, institutional and public buildings. They provide fast, quiet, positive air distribution. And where space is limited, size of units can be reduced more than 25% by using Modine Type W coils and operating on hot water instead of steam.

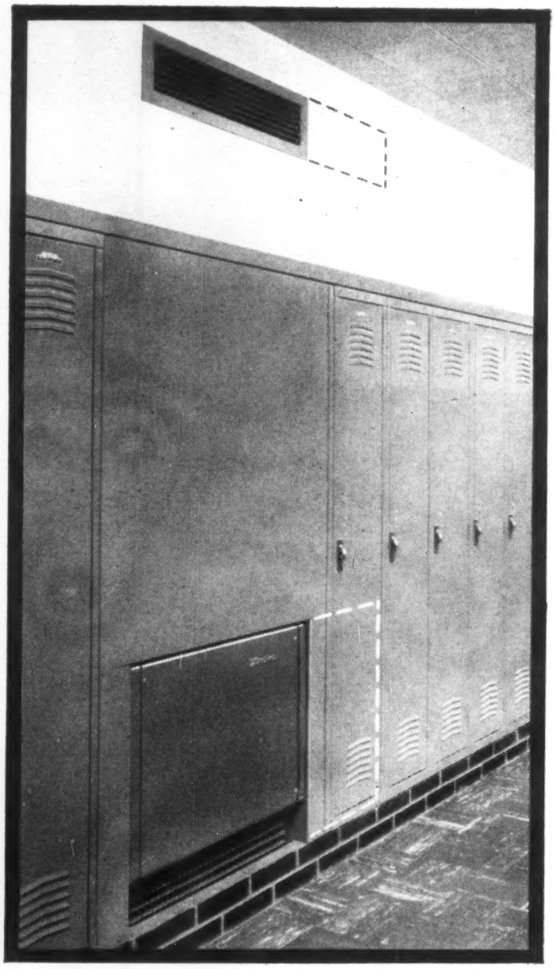
They can be installed upright or inverted . . . fully exposed, recessed or concealed . . . on walls, floors or ceilings. Some models are for steam or hot water heating—others heat with hot water, cool with chilled water. Some can be installed with ducts.

Easily attached accessories permit ventilating with fresh outside air. When so equipped, cabinet units meet many requirements where the expense of unit ventilators is not warranted.



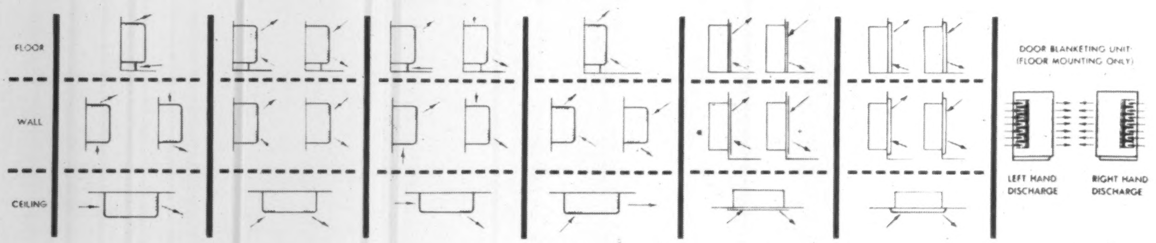
Series of Type BF units provide quiet, uniform heat distribution in this spacious, modern church.

Adaptability to ceiling mounting makes Modine cabinet units ideal where wall space is limited.

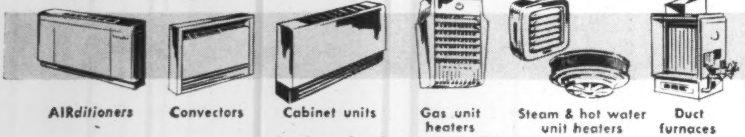


Here's how the use of Type W coils with hot water can reduce unit size. Dotted lines indicate space steam-coil units of equal capacity would need.

Choose from seven distinct cabinet types

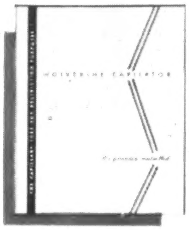

FLOOR
WALL
CEILING
DOOR BLANKETING UNIT (FLOOR MOUNTING ONLY)
LEFT HAND DISCHARGE
RIGHT HAND DISCHARGE

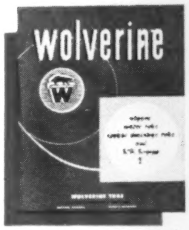
Call the Modine representative listed in your classified phone book. Or write to Modine Mfg. Co., [illegible] DeKoven Ave., Racine, Wis., for Bulletin 557.


C-1351
AIRditioners
Convectors
Cabinet units
Gas unit heaters
Steam & hot water unit heaters
Duct furnaces

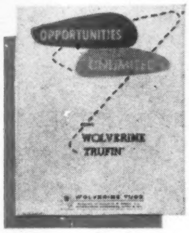
In Canada: Sarco, Ltd., Toronto

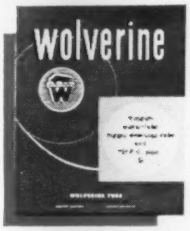
Modine
MANUFACTURING COMPANY


1. Wolverine Capilator Catalog

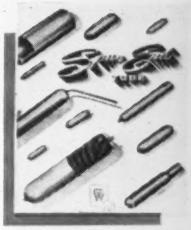


2. Aluminum Tube Catalog


OPPORTUNITIES
UNLIMITED
WOLVERINE
TRUFIN
3. Opportunities Unlimited



4. Wolverine Trufin Catalog


5. Spun End Catalog

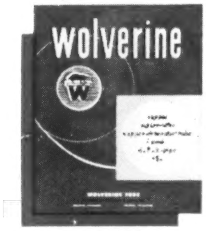
The measure of
TUBEMANSHIP
6. Measure of Tubemanship

10. Condenser Tube Catalog

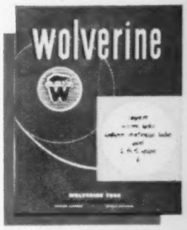
When it comes to tube... come to Wolverine

From Wolverine, manufacturers can obtain a great variety of tubular products. These range from such products as tiny, plug-drawn Wolverine Capilator® used for restriction purposes, to commercial copper and aluminum tube up to six inches in diameter.

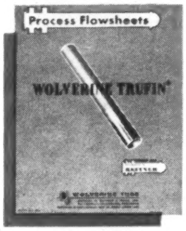
Illustrated on this page—and reading like tubing's "best seller list"—is the latest Wolverine Tube literature dealing with all the company's products and specialized services. Look these catalogs over. The coupon, below, will bring you the catalog—or catalogs—of your choice without delay . . . or obligation. Get it into the mail today!

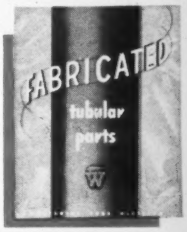


7. Wolverine Capilator Booklet



11. Commercial and Condenser Tube Catalog

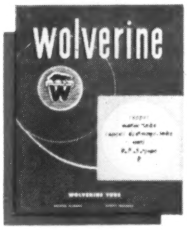

Process Flowsheets
WOLVERINE TRUFIN
8. Process Flowsheets


FABRICATED
tubular
parts
12. Fabricated Tubular Parts Catalog

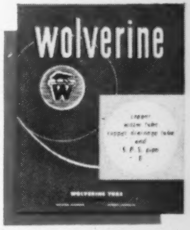
CALUMET & HECLA, INC.
CALUMET DIVISION
WOLVERINE TUBE DIVISION
FOREST INDUSTRIES DIVISION
GOODMAN LUMBER COMPANY
CALUMET & HECLA OF CANADA LIMITED
CANADA VULCANIZER AND EQUIPMENT COMPANY LIMITED

WOLVERINE TUBE
Division of Calumet & Hecla, Inc.
1461 CENTRAL AVE., DETROIT 9, MICH.
Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA.
SALES OFFICES IN PRINCIPAL CITIES.
EXPORT DEPARTMENT, 13 EAST 40TH STREET, NEW YORK 16, NEW YORK



9. Copper Refrigeration Tube Booklet



13. Wolverine Copper Water Tube Catalog

Please send me the following Wolverine catalogs:

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15

NAME__________ TITLE__________

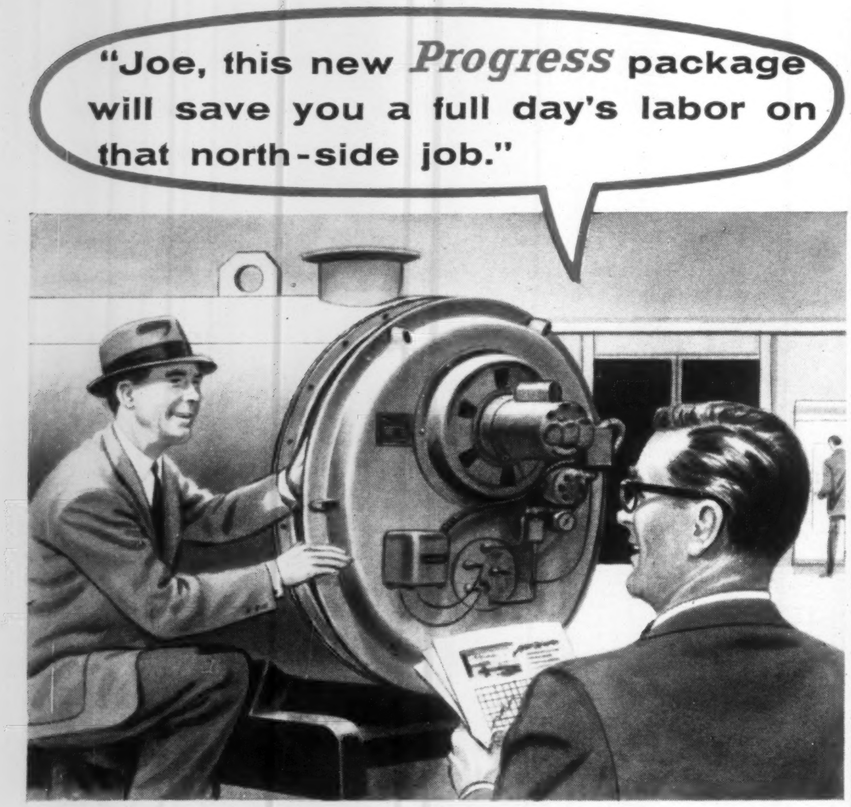
COMPANY__________

ADDRESS__________

CITY__________ ZONE_____ STATE__________

14. Wolverine Corrosion Chart

Statement of Scope
TUBEMANSHIP
15. Statement of Scope

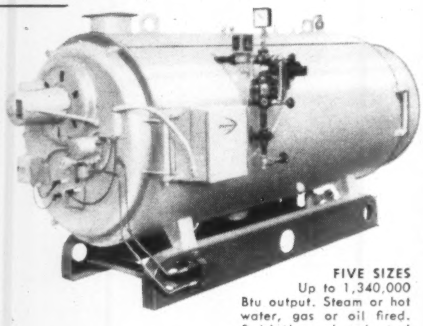

"Joe, this new *Progress* package will save you a full day's labor on that north-side job."

Wholesalers, contractors agree: *Progress* package ends profitless "scatter-buying"* because it's a complete boiler

Now, for the first time in the commercial heating field—Cleaver-Brooks brings you a boiler that effectively simplifies planning, purchase and installation! The new Progress package earns more profit for you because substantial installation time (at least a full day or more) is saved on *every* job.

Progress is a fully fire-tested boiler, ready to operate after connections to service lines. You buy from *one* responsible manufacturer. Warranties are backed by Cleaver-Brooks, the best-known name in packaged boilers. You sell unmatched performance and efficiency at a greater profit. Ask your wholesaler for detailed proof in a fair comparison with built-up jobs.

*Time and profits wasted in planning, buying, and installing individual boiler components.



FIVE SIZES
Up to 1,340,000 Btu output. Steam or hot water, gas or oil fired. Sold through selected wholesalers only.

Shipped direct to the job — ready for immediate installation. Base frame sets solidly on any floor. Cleaver-Brooks starting service representative places boiler in operation and trains attendant at no extra charge.

Contractors, engineers, architects, users — write NOW for full details on America's most modern boiler — in step with progress . . . way ahead in design. Ask for catalog AD-157.

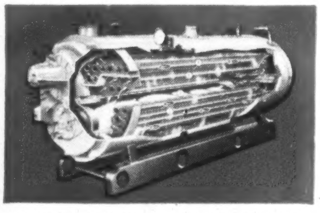
Cleaver-Brooks
Progress
Packaged Boiler

Progress boiler sets new standards in silent operation

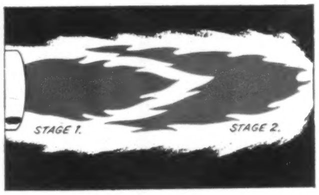
Has noise been a problem in your installations? Progress completely eliminates this complaint. At peak load it more than meets the low sound levels required for schools, hospitals and other buildings.

An exclusive type of caseless fan draws combustion air into the large plenum chamber of the front head. It completely confines and deadens fan and air noises.

Progress boilers are products of Cleaver-Brooks Company, originators of packaged boilers — the first boilers of their class built to the quality standards of costly industrial boilers.



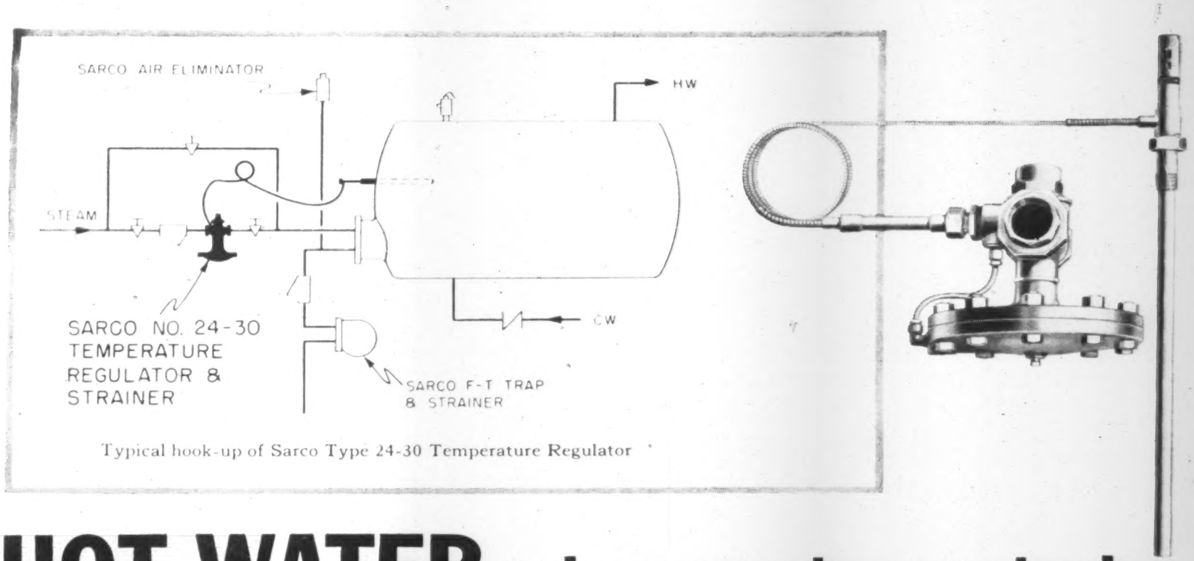
PROGRESS BOILER IS COMPLETELY INTEGRATED — boiler, burner, controls and insulation. Four-pass, forced-draft design, electronic controls, clean-burning, quiet operation with guaranteed 80% thermal efficiency.


STAGE 1.
STAGE 2.

SOFT FLAME START assures smooth ignition. You get distinctive two-stage burner light-off. The gradual-opening diaphragm valve and positive electric-gas pilot ignition assure clean, quiet light-offs.

FACTORY INSPECTED AND TESTED — In addition to certification by insurance inspectors covering conformity to A.S.M.E. code, Progress boilers are pre-tested by actual firing. All electrical equipment conforms to the National Electric Code.

CLEAVER-BROOKS COMPANY
DEPT. F. 313 E. KEEFE AVENUE
MILWAUKEE 12, WISCONSIN


SARCO AIR ELIMINATOR
HW
STEAM
CW
SARCO NO. 24-30 TEMPERATURE REGULATOR & STRAINER
SARCO F-T TRAP & STRAINER

Typical hook-up of Sarco Type 24-30 Temperature Regulator

HOT WATER...in your storage tank ...when you want it...*and at minimum cost!*

That's the performance you get when this Sarco Temperature Regulator stands guard on your water heater.

With fuel representing about 50% of your total direct power costs, it's important that you *get hot water at lowest cost per wash.*

Here's how the Sarco 24-30 Temperature Regulator does the job:

NO OVERHEATING — during periods of no draw-off. The single seated valve shuts tight, prevents creeping of temperature.

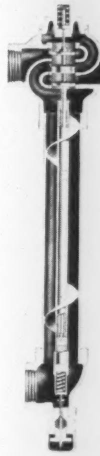
LOW INSTALLATION COST — the T R 24-30 is self-contained and self-operated, no need to install compressed air or electric lines.

CLOSE TEMPERATURE CONTROL — thermostat actuates internal pilot valve which immediately opens or closes main valve.

LOW-MAINTENANCE PACKLESS SEALS — trouble-free design eliminates stuffing boxes, no repacking, no sticking or leakage of exposed valve stems.

WIDE RANGE OF ADJUSTMENT—you can adjust this temperature regulator 25° higher or lower than the temperature setting.

So, if you're not satisfied with your hot water service, call your local Sarco representative or write for Bulletin 800 Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.



Need Tempered Water ?

This Sarco Water Blender automatically mixes hot and cold water, delivers blended water at any desired temperature. Factory set for any temperature to 200° F., is easily adjusted to 15° F. lower and up to 40° F. higher than factory setting. Ask for Bulletin 800.

SARCO

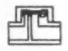
SAVES STEAM

improves product quality and output

2046-B

Only Sarco Makes All 5 Types

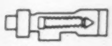
That's why Sarco can give impartial advice on proper steam trap selection.



Thermodynamic Steam Traps

Thermostatic Steam Traps

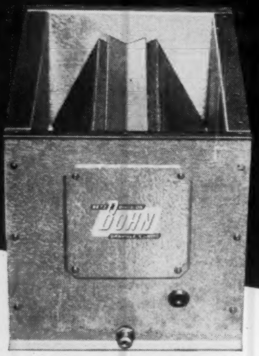
Float Thermostatic Steam Traps



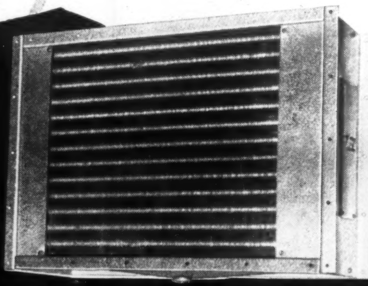
Liquid Expansion Steam Traps

Camlift Bucket Steam Traps

BOHN *Presents the* NEW ANGLE



New Model BV Vertical Furnace Bonnet Evaporator Units. Capacities 37,000 and 50,000 BTU per hr. Vertical air flow. Features unique condensate eliminators.



New Model BH Horizontal Furnace Bonnet Evaporator Units. Capacities 23,900 to 62,000 BTU per hr. Horizontal air flow. Reversible—has drain pan in top and bottom.

Residential Evaporator Air Conditioning Units

No Dead Air Space • Insulated Cabinets

The NEW ANGLE in residential air conditioning design offers you many selling and installation advantages!

Only BOHN units provide a patented distributor employing a low pressure drop venturi which aids compressor efficiency. Minimum pressure drop. No equalizer required.

Only BOHN units contain special condensate drains to separate water from air flow in either direction! Air flows efficiently through the coil for maximum heat transfer *without dead air space.*

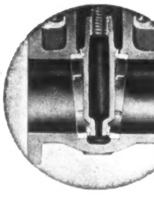
Heavy gauge grained aluminum cabinets and access panels are insulated to eliminate exterior sweating! Rust-proof. No painting required.

All models are U L listed. For details and specifications, request BOHN CATALOG BU-1.

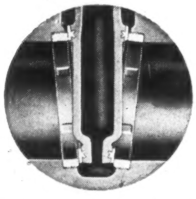
BETZ DIVISION
BOHN
DANVILLE, ILLINOIS

Manufacturers of Commercial Refrigeration, Industrial Air Conditioning and Special Heat Transfer Surfaces

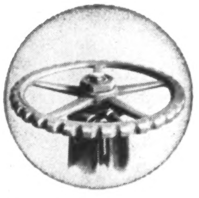
BOHN ALUMINUM & BRASS CORPORATION • BETZ DIVISION • DANVILLE, ILLINOIS



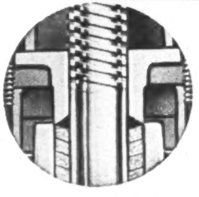
Straight-Flow Port Design reduces fluid turbulence to a practical minimum.



Seat Rings of end-seated type are screwed into the body.



Sure-Grip Malleable Handwheel for non-skid gripping even with heavy gloves.

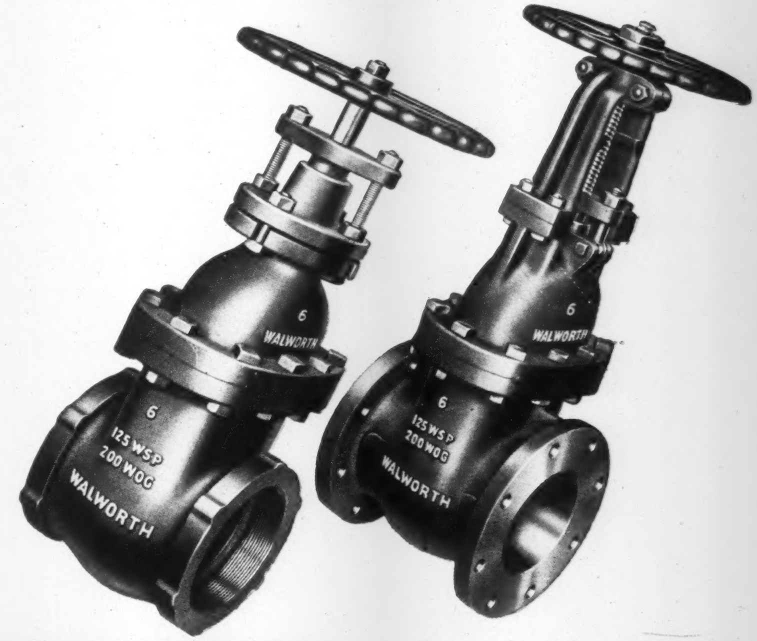


Brass Liner on Glands assures greater resistance to corrosion and scoring.

WALWORTH

iron body gate valves

with screwed or flanged ends



... 8 Outstanding Features

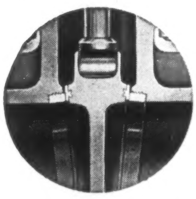
For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.

WALWORTH

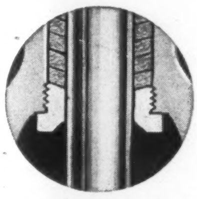
valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

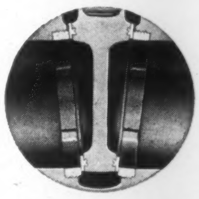
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



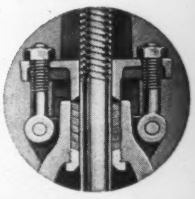
T-head Disc-to-Stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.



Bronze Back-Seat Bushings in bonnets of OS&Y valves.



Solid Web Type Disc in OS&Y valves for greater strength and longer service.



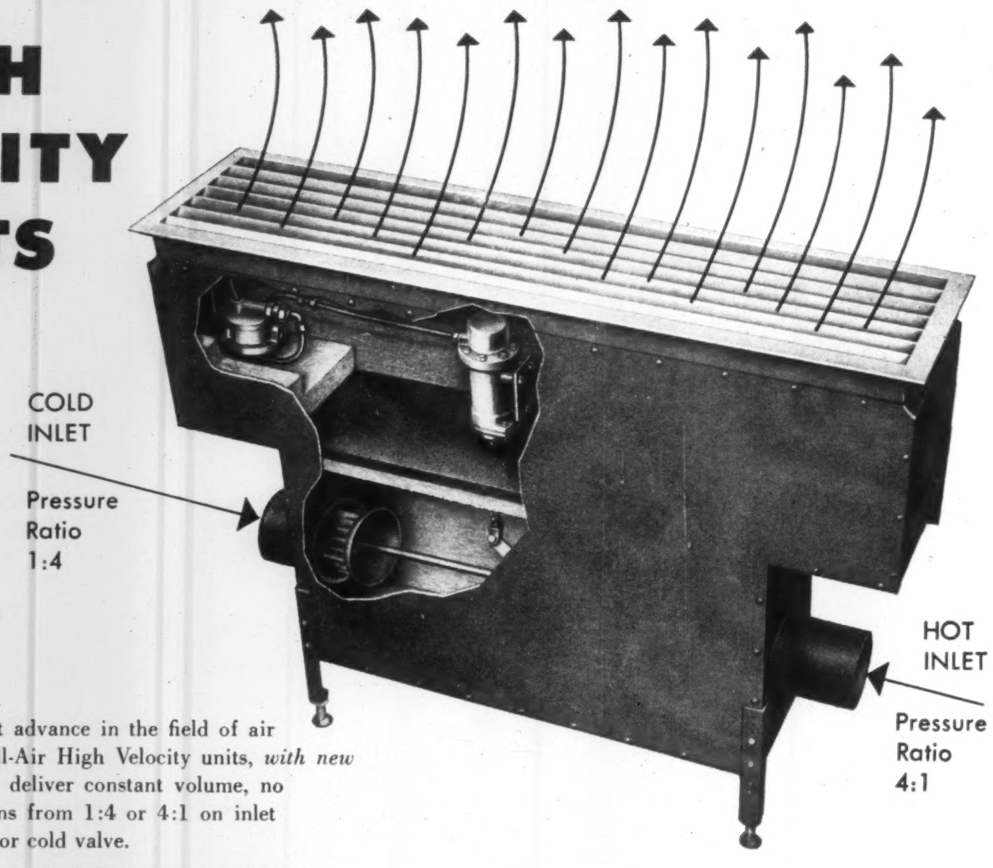
Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

ANEMOSTAT *Announces....*

ALL-AIR

CONSTANT VOLUME

HIGH VELOCITY UNITS



Here is a vitally important advance in the field of air distribution. Anemostat All-Air High Velocity units, *with new simple automatic controls,* deliver constant volume, no matter what the fluctuations from 1:4 or 4:1 on inlet pressures of either the hot or cold valve.

Each unit is a single package including the controls and integral thermostats if required. There is complete accessibility of all controls through removable diffusers. No access panels are required. Capacities of CONSTANT VOLUME units can be pre-set at the factory.

These Anemostat CONSTANT VOLUME units

- Assure scientific draft-free distribution of air.
- Are available in 100% induction units.
- Include Anemostat die-cast metal rocket-socket valves. More than 50,000 of these valves are in service, and not a single one has needed maintenance.
- Operate on standard 15 lb positive acting compressed air systems.

See your nearby Anemostat representative for complete details on these revolutionary Anemostat All-Air CONSTANT VOLUME High Velocity units.

Anemostat: The Pioneer of All-Air High Velocity Systems

ANEMOSTAT®

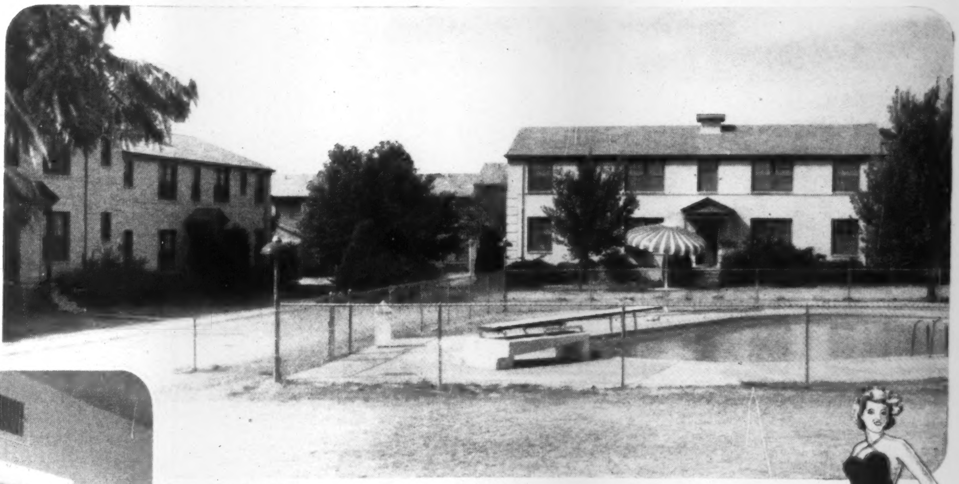
DRAFTLESS *Aspirating* **AIR DIFFUSERS**

ANEMOSTAT CORPORATION OF AMERICA

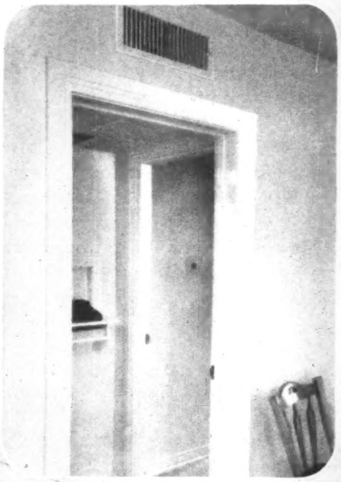
10 EAST 39TH STREET, NEW YORK 16, N. Y.

Representatives in Principal Cities

AC 1344



Hide-a-way air conditioner is mounted above hallway

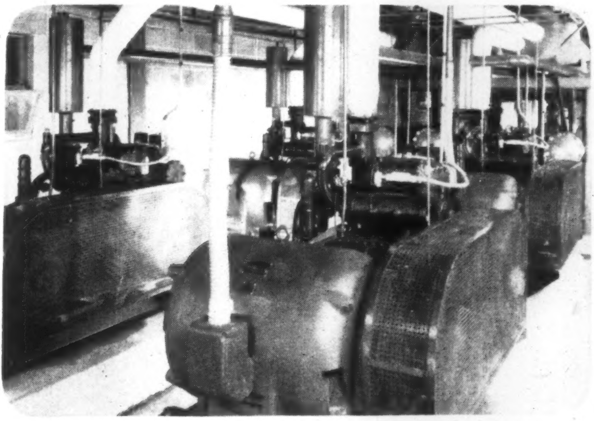


256 Luxury Apartments near Dallas Equipped with

TRADE FRICK MARK®

Air Conditioning

Building housing refrigerating system has cooling tower, with fans, on roof



Frick "ECLIPSE" compressors cooling 256 Woodlane Apartments

The Woodlane Apartments comprise 18 buildings, covering four city blocks. Built and operated by Corrigan Properties, Inc., they offer year-'round air conditioning, among other attractions; people wait for a chance to rent them.

Beatty Engineering Co., Frick Air Conditioning Contractors in Dallas, designed and installed the year-'round system. Four Frick "ECLIPSE" compressors furnish 400 tons of refrigeration. Both the owners and occupants are much pleased with results.

You, too, will be pleased with Frick equipment—whether for air conditioning, ice making, quick freezing or other refrigerating work. Get bulletins and estimates now: write

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA., U. S. A.

Also Builders of Power Farming and Sawmill Machinery

from "Chicago"

A SPECIFIC TYPE OF PUMP

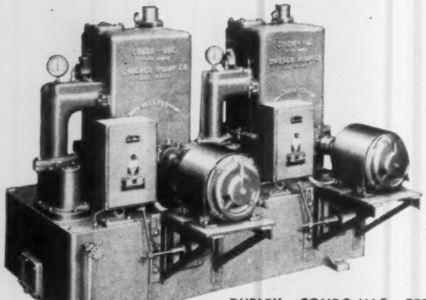
IN
CHICAGO PUMP CO.

for every Steam Heating System

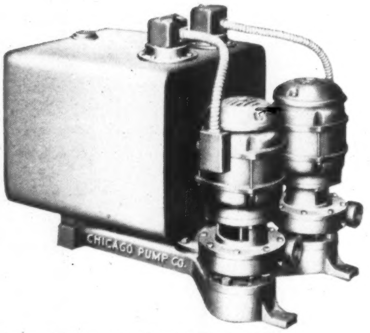
There's a Chicago Pump specifically designed for every type of building service steam heating system. No type of system has been overlooked by our engineers. *For any unusual condition; for below floor returns; for low vacuum systems; for small capacity, high pressure requirements; or for any standard system* . . . there is a Chicago Pump specifically designed 100% for the job. That means, there's no longer any reason for installing a pump that's not 100% suited to meet your needs. And you can be sure with a Chicago Pump that all ratings and receiver capacities meet or exceed standards of the American Society of Heating and Air Conditioning Engineers.

Write for details and free survey of your steam heating, pump requirements.

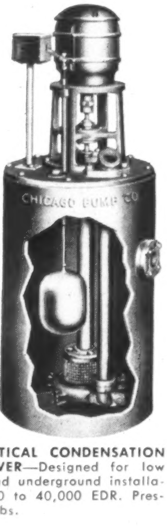
At left the TYPE AVC CONDENSATION PUMP & RECEIVER—Heavy cast iron receiver with low inlet for floor mounting or shallow pit. Cap. 500 to 10,000 EDR. Pressure 10-30 lbs.



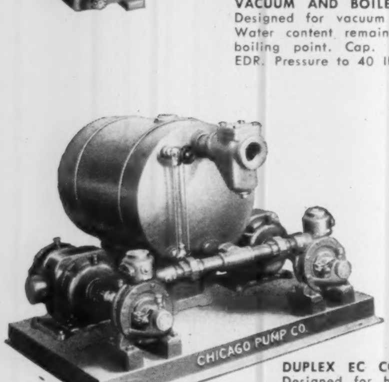
DUPLEX CONDO-VAC RETURN LINE VACUUM AND BOILER FEED PUMP—Designed for vacuum heating systems. Water content remains constant up to boiling point. Cap. 2500 to 150,000 EDR. Pressure to 40 lbs.



SURE RETURN CONDENSATION PUMP & RECEIVER — Condensate flows by gravity from receiver through base to pump. Available in single or duplex units. Cap. up to 75,000 EDR. Pressures, low or medium.



TYPE CLLI VERTICAL CONDENSATION PUMP & RECEIVER—Designed for low return service and underground installations. Cap. 1000 to 40,000 EDR. Pressures 10 to 25 lbs.



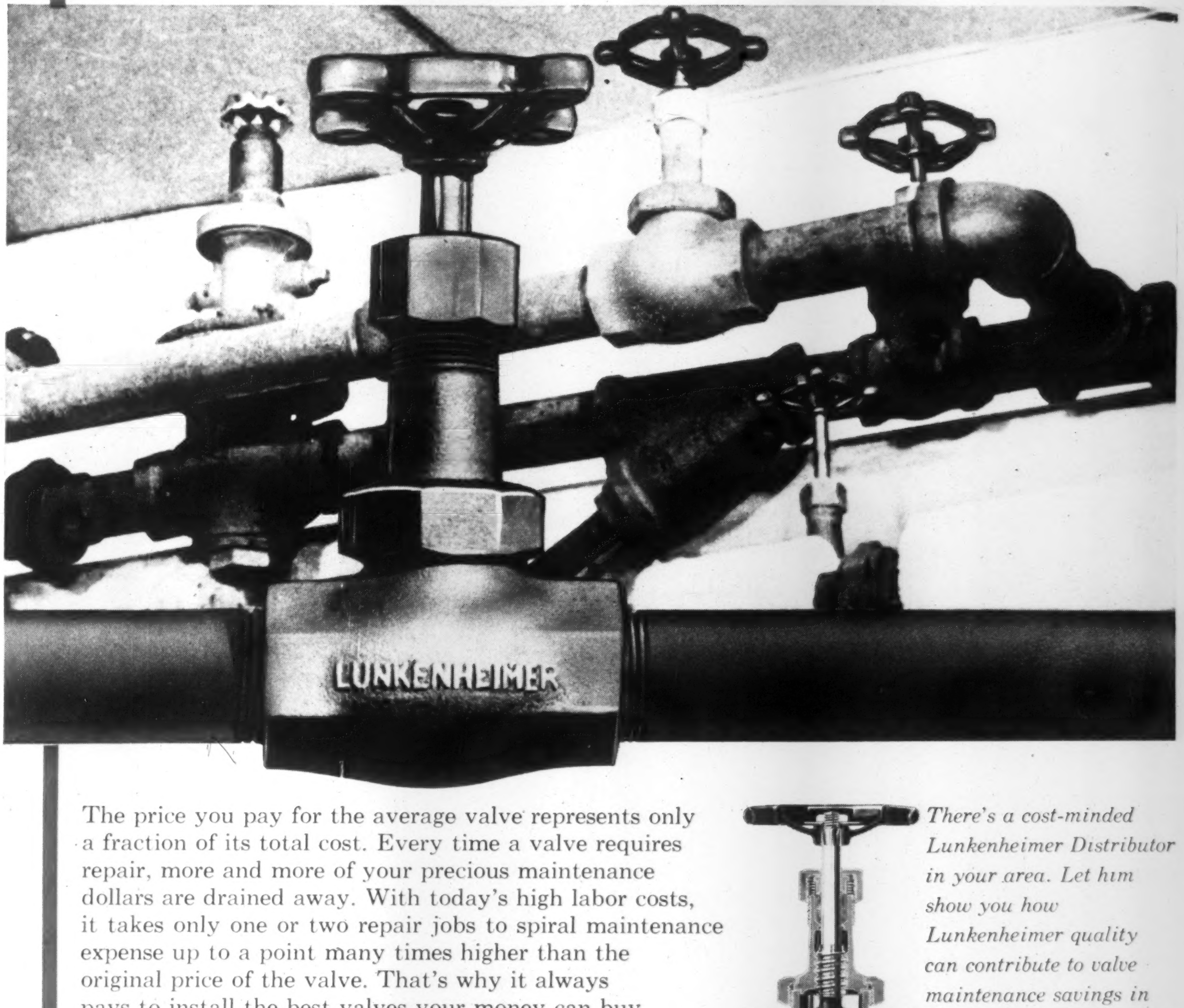
DUPLEX EC CONDENSATION UNIT—Designed for high pressure, small capacity operating conditions. Cap. up to 50,000 EDR. Pressures up to 150 lbs.

CHICAGO PUMP COMPANY
Subsidiary of Food Machinery and Chemical Corporation
BUILDING PUMP DIVISION
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

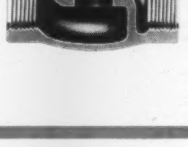
Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems. Flush Kleen ® Sewage Ejectors, Little Giant ® & Non-Clog Bilge Pumps. Pumps for every Industrial use.

Don't let LOW-QUALITY drain away YOUR *Maintenance* DOLLARS

The cost of a
LUNKENHEIMER VALVE
Gets smaller . . .
and smaller . . .
and smaller . . .
with each passing year
of dependable service.



The price you pay for the average valve represents only a fraction of its total cost. Every time a valve requires repair, more and more of your precious maintenance dollars are drained away. With today's high labor costs, it takes only one or two repair jobs to spiral maintenance expense up to a point many times higher than the original price of the valve. That's why it always pays to install the best valves your money can buy. When you insist on the extra margin of good workmanship and quality materials that go into Lunkenheimer Valves, you get your investment back many times over in trouble-free, maintenance-free service. The Lunkenheimer Company, Cincinnati 14, Ohio.

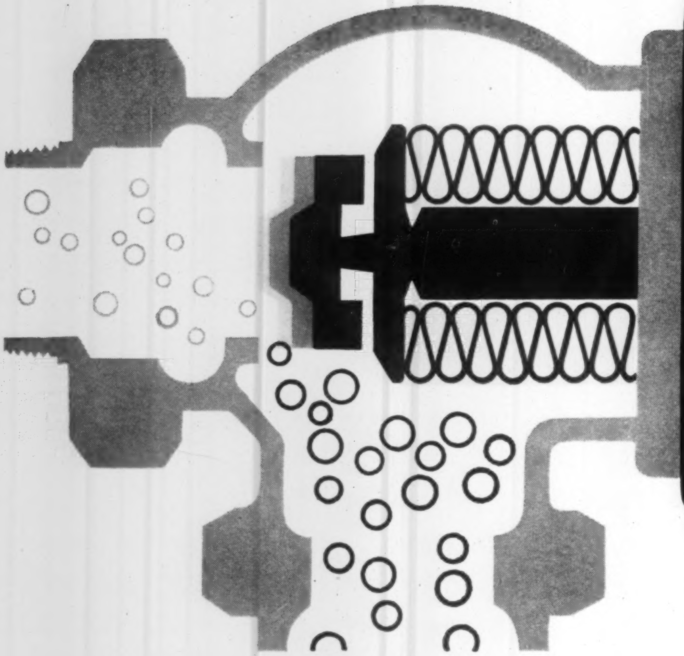


There's a cost-minded Lunkenheimer Distributor in your area. Let him show you how Lunkenheimer quality can contribute to valve maintenance savings in your plant. And be sure to check the amazing performance records of LQ600, with patented Brinalloy® seats and discs.

L-357-18

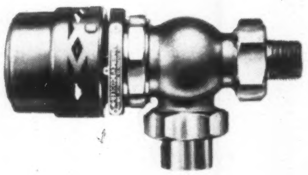
- BRONZE
- IRON
- STEEL
- PVC

LUNKENHEIMER®
THE ONE *Great* NAME IN VALVES



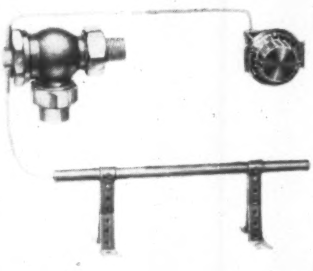
Anyone can afford room temperature control the Fulton Sylphon way

With Fulton Sylphon Automatic Radiator Valves, individual room temperature control is practical and economical for any building heated by steam or hot water radiation systems. First off, this type of control costs less than most. Your installation costs are lower because there is no electrical wiring, piping, or accessory equipment. Owner operating costs are lower because these self-operated valves require no outside source of power. And unlike "on-off" controls, they *throttle* heat input *continuously*. This action not only conserves the heat supply medium, but also keeps rooms from alternating between "boiling hot" and "stone cold."



FOR EXPOSED RADIATORS

No. 885 Automatic Radiator Valve is not only self-powered, but also self-contained so that it simply installs in place of the hand valve. For either steam or hot water systems. A turn of the valve head sets it to maintain any temperature between 60° and 75° F. Packless valve eliminates maintenance problems. ½'', ¾'' and 1'' valves. No. 885 Valve can also be used with convectors and finned pipe.



CONVECTORS · CONCEALED RADIATORS

The No. 895 Automatic Radiator Valve is designed especially for the regulating and installation requirements of enclosed steam, vapor or vacuum units. Only the control knob shows. Adjusts instantly for any temperature from 40° to 90° F. Valve is packless . . . no packing replacement problems. Valve sizes ½'', ¾'' and 1''. Fulton Sylphon offers Model No. 522-A for hot water installations.

SEND FOR CATALOG BULLETIN JH-80

Mr Controls

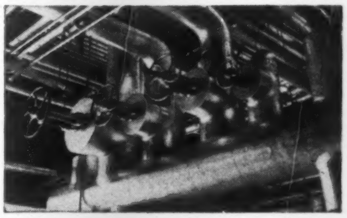
Robertshaw-Fulton

CONTROLS COMPANY

FULTON SYLPHON DIVISION · Knoxville 1, Tennessee

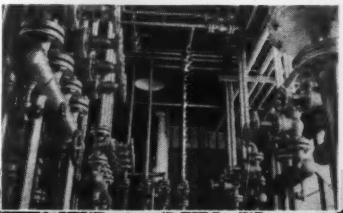
You see OIC Valves everywhere

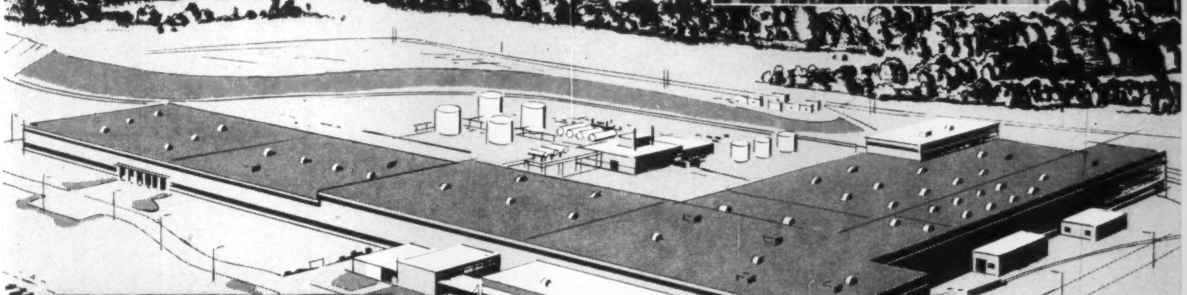
STEAM

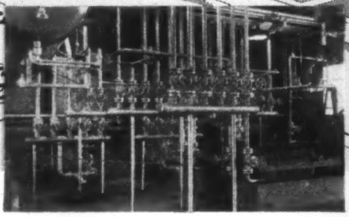


at the new General Electric Distribution Transformer Plant, Hickory, North Carolina.

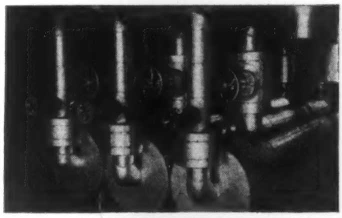
OIL PROCESSING







TRANSFORMER OIL FILTRATION



PRE-HEATING FUEL OIL

The name *General Electric* is a promise of quality to users of complex electrical equipment. To help make good that promise, GE insists on this same high quality from its own suppliers. That's why you see OIC Valves of many types in nearly all valve installations in this new General Electric plant.

Architect-Engineer: *Robert & Company Associates, Atlanta, Ga.*

Mechanical Contractor: *Hicks & Ingle Co., Charlotte, N. C.*

Materials Furnished by: *Atlas Supply Company, Charlotte, N. C.*

OIC
FOUNDED 1881
VALVES

FORGED & CAST STEEL, BRONZE & IRON, LUBRICATED PLUG VALVES

"Little brown church in the vale" ...*modern version*

Heated radiantly with Steel Pipe

For this widely publicized community church, built for a total of only $67,000, steel pipe radiant panel heating fitted the budget and the heating requirements perfectly.

The simple beauty and dignity of an interior unmarred by exposed heating elements, and the all-purpose flexibility made possible by sliding walls, governed the selection of "invisible" radiant heating. The known economy and durability of steel pipe for heating made *it* first choice.

Yes, steel pipe has been proved in more than 60 years of hot water and steam heating applications. It still is the most widely used pipe in the world for radiant heating, snow melting, plumbing, fire sprinkler systems, structural applications, air, gas and water lines!

Write for the free 48-page color booklet, "Radiant Panel Heating with Steel Pipe."

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
150 East Forty Second St., New York 17, N.Y.

Steel Pipe is First Choice

SCHOOL
CAREFUL
CHILDREN

But it takes more than a sign to stop low water . . .

. . . and the hazards that can accompany a low water condition in both a steam and hot water heating boiler.

We are all agreed that our schools must be made as safe as possible. With schools so crowded today and facilities overtaxed, there is greater need for vigilance than ever before.

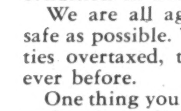
One thing you can do is to see that the boiler water line is under the endless vigil of McDonnell boiler water level controls. Low water can strike anywhere, for any of a score or more reasons, bringing with it the threat of serious and costly damage. And make no mistake about this: Low water is just as much of a possibility in hot water boilers as in steam boilers.

For the average school heating boiler, McDonnell Feeder Cut-off Combinations are a simple, time-proved answer. They add water automatically when needed to maintain a safe water level in the boiler, then stand by to stop the burner if any emergency condition drops the water line to a dangerous level. There is nothing better available for the vital task of protecting a boiler against hazardous low water.

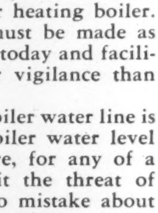
Right now is the time to act. Your local school board must rely on you to bring it to their attention. You'll be doing your community even a bigger favor than you do yourself.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

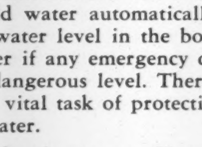
Doing One MM SAFETY CONTROLS *Thing Well*



No. 51-2, the Boiler Water Feeder and Low Water Cut-off combination that fits most school jobs. For steam and hot water space heating boilers. Other combinations to fit all boilers.



230 Series Pressure Relief Valves for hot water space heating boilers. Meet ASME Boiler Code in every respect; rated and certified by the National Board.



No. 150 Pump Control, Cut-off and Alarm Switch. For boilers up to 150 lbs. The most widely used, time-proved control of its type. Also available with integral water column, as No. 157.

McDONNELL *Boiler Water Level Controls*

Your Jobber Sells Them

INSTALL IT . . .

FORGET IT!

Flexon® PACKLESS EXPANSION COMPENSATOR

Install it . . . and walk away from it once and for all! Flexon Model H Expansion Compensator is the modern way to take up expansion and motion in pipes up to 3″, because it's *packless.* No maintenance required—ever. It's there to stay, for the life of the building.

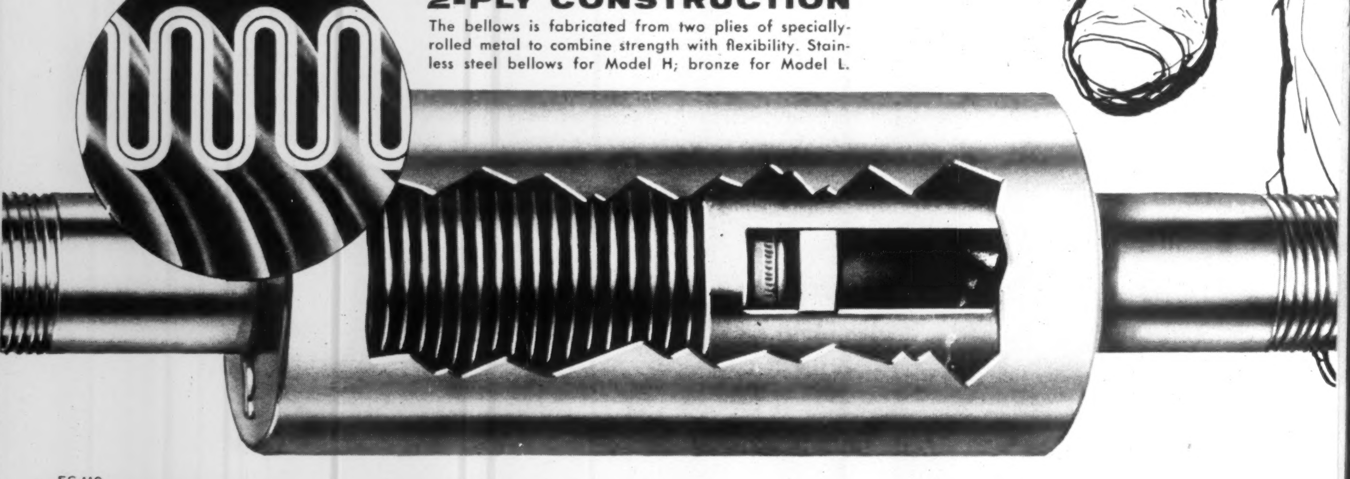
You get delivery when you need it, because Flexon Model H Expansion Compensators are available from stock. *And here's a bonus!* They cost much less per inch of stroke than any other method of absorbing pipe expansion. Up to 1¾″ total movement in all sizes. Working pressures up to 150 p.s.i. for ¾″ and 1″ sizes; up to 100 p.s.i. for larger sizes.

Write for facts about Flexon Expansion Compensators, design and cost data, and the name of your Flexon distributor.

The inside story

2-PLY CONSTRUCTION

The bellows is fabricated from two plies of specially-rolled metal to combine strength with flexibility. Stainless steel bellows for Model H; bronze for Model L.



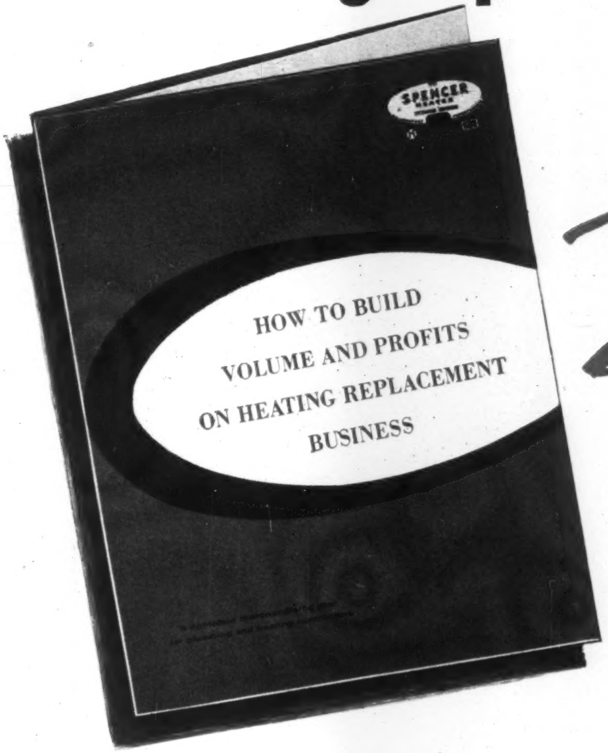
EC-110

Flexonics corporation

EXPANSION JOINT DIVISION • 1391 S. THIRD AVENUE, MAYWOOD, ILLINOIS

EXPANSION JOINTS · METAL HOSE · NON-METALLIC HOSE · BELLOWS · AIRCRAFT COMPONENTS

NOW... a plan to boost your heating replacement business this summer


SPENCER HEATER
HOW TO BUILD VOLUME AND PROFITS ON HEATING REPLACEMENT BUSINESS

FREE

Write now for this new, practical, step-by-step program that can mean increased volume and more profits *for you!*

A practical working plan

This *free* Kit takes you through each step involved in setting up a practical program—shows you how to go about getting heating plant replacement business, and more profit dollars. Included in it are some of the "tools" you'll need to get the program underway.

MAIL THE COUPON TODAY!

There's no cost or obligation. Organize now to increase your heating replacement sales this Summer.

SPENCER HEATER

AVCO

SBI

Answers questions like these:

1. Who are my logical prospects and how can I reach them?
2. How can I alert my own service men to replacement business possibilities?
3. What's the best way to approach my prospects?
4. How can I overcome the prospect's resistance to "having it done now"?
5. What are the two sure-fire keys to closing the sale?

Spencer Heater, Lycoming Div.,
Avco Mfg. Corp., Williamsport, Pa.

Gentlemen:

Please send me your *free* Kit "How to Build Volume and Profits on Heating Replacement Business."

My Name____________________

Name of Company____________________

Street____________________

City____________________State__________

CLIP AND POST!

You'll find this advertisement a convenient reference. Clip it now, and post on your shop wall.

Pressure Temperature Chart

Vapor Pressure—psig

Red Figures= inches of mercury vacuum

Temp.	genetron			
°F	11	12	22	113
—50	28.9	15.4	6.0	
—45	28.7	13.3	2.6	
—40	28.4	11.0	0.6	
—35	28.1	8.4	2.7	
—30	27.8	5.5	5.0	29.3
—25	27.4	2.3	7.6	29.2
—20	27.0	0.6	10.3	29.1
—15	26.5	2.4	13.3	28.9
—10	26.0	4.5	16.6	28.7
—5	25.4	6.7	20.2	28.5
0	24.7	9.2	24.1	28.2
5	24.0	11.8	28.3	27.9
10	23.1	14.6	32.9	27.6
15	22.1	17.7	37.9	27.2
20	21.1	21.0	43.3	26.8
25	19.9	24.6	49.0	26.3
30	18.6	28.5	55.2	25.8
35	17.2	32.6	61.9	25.2
40	15.6	37.0	69.0	24.5
45	13.9	41.7	76.6	23.8
50	12.0	46.7	84.7	22.9
55	9.9	52.0	93.3	22.0
60	7.7	57.7	102.5	21.0
65	5.3	63.8	112.2	19.9
70	2.6	70.2	122.5	18.7
75	.1	77.0	133.4	17.3
80	1.6	84.2	145.0	15.9
85	3.2	91.8	157.2	14.3
90	5.0	99.8	170.1	12.5
95	6.9	108.3	183.7	10.6
100	8.9	117.2	197.9	8.6
105	11.1	126.6	212.9	6.4
110	13.4	136.4	228.7	4.0
115	15.9	146.8	245.3	1.4
120	18.5	157.7	262.6	0.7
125	21.3	169.1		2.2
130	24.3	181.0		3.7
135	27.5	193.5		5.4
140	30.8	206.6		7.2
145	34.4	220.3		9.2
150	38.2	234.6		11.2

genetron®

super-dry refrigerants

There's a "Genetron" Super-Dry Refrigerant for your every need. They're available everywhere—*see your wholesaler!*

genetron 11	ORANGE LABEL	TRICHLOROMONOFLUOROMETHANE
genetron 12	WHITE LABEL	DICHLORODIFLUOROMETHANE
genetron 22	GREEN LABEL	MONOCHLORODIFLUOROMETHANE
genetron 113	PURPLE LABEL	TRICHLOROTRIFLUOROETHANE
genetron 114A	DARK BLUE LABEL	DICHLOROTETRAFLUOROETHANE

HANDY POCKET SIZE, TOO!

The "Genetron" pressure temperature chart above is also available—free—as a handy pocket-size plastic card, for ready reference on the job. Ask your "Genetron" wholesaler for *yours.*

Allied Chemical

genetron department

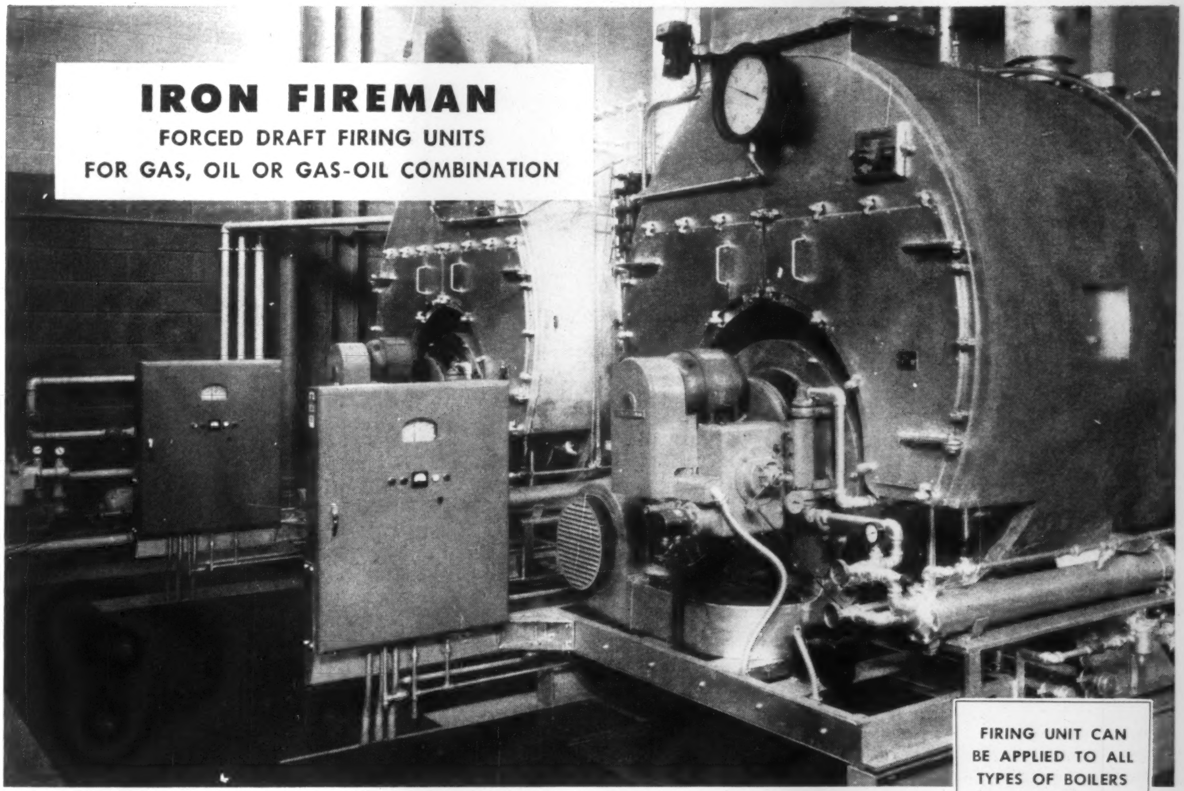
GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

IRON FIREMAN

FORCED DRAFT FIRING UNITS FOR GAS, OIL OR GAS-OIL COMBINATION



Typical installation of Iron Fireman packaged oil-gas firing units in Scotch type boilers. Illustrated are Kewanee-Iron Fireman boiler-burner units.

Here are features that Architects, Engineers and Owners appreciate

Easy to size and specify. After deciding on the fuel (gas, oil or gas-oil combination) and determining the required load, it is only necessary to refer to a simple chart to find the correct size of unit for your job.

Big reserve capacity. Boiler-burner units are conservatively rated. This means that the unit will carry its rated load at a comfortable "cruising speed." Maintenance costs are low, and high peak loads are taken in stride.

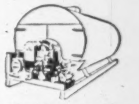
Economy. Installation costs are low. No special boiler setting; no intricate wiring (factory wired and tested control panel is part of the unit); no complicated piping; no on-the-job refractory work. Factory engineering throughout assures exceptional fuel economy.

No high stacks—no high ceilings. Forced draft eliminates costly and unsightly stacks. Compact boiler requires little headroom.

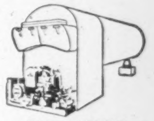
Firing unit fits all types of boilers. The Iron Fireman forced draft burner is a complete firing system which requires no firebox alteration, no pit for underfloor air, no ignition arch. Easily applied to new or existing boiler settings.

Send for catalog with specifications

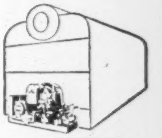
FIRING UNIT CAN BE APPLIED TO ALL TYPES OF BOILERS



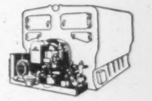
SCOTCH MARINE



STEEL FIREBOX



WATER TUBE



CAST IRON

IRON FIREMAN®

AUTOMATIC FIRING EQUIPMENT
FOR OIL, GAS, COAL

IRON FIREMAN MANUFACTURING COMPANY
3364 West 106th Street, Cleveland 11, Ohio
(In Canada, 80 Ward Street, Toronto, Ontario)

Please send information on following equipment:
☐ Complete boiler-burner units.
☐ Forced draft firing unit.

Name____________________

Firm____________________

Address____________________

City____________________State__________

Modernize your v-belt drives with

TAPER-LOCK SHEAVES

—proved in over a million installations!

- No flange. No collar. *It's different.*
- Easy on — easy off.
- Just tighten the screws that wedge the bushing. Simple, isn't it?
- Always a perfect fit on shaft — tight as "shrunk-on."
- Complete range of sizes. A, B, C and D grooves, in *stock*.
- Try it—and you'll standardize on it!

Taper-Lock Sheaves, with their precision machining, team up with matched Sealed-Life V-Belts to insure steady performance and unusually long belt life.

DODGE MANUFACTURING CORPORATION, 1600 Union St., Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new methods. Look for his name under "Power Transmission Machinery" in your classified phone book, or write us.

DODGE
of Mishawaka, Ind.

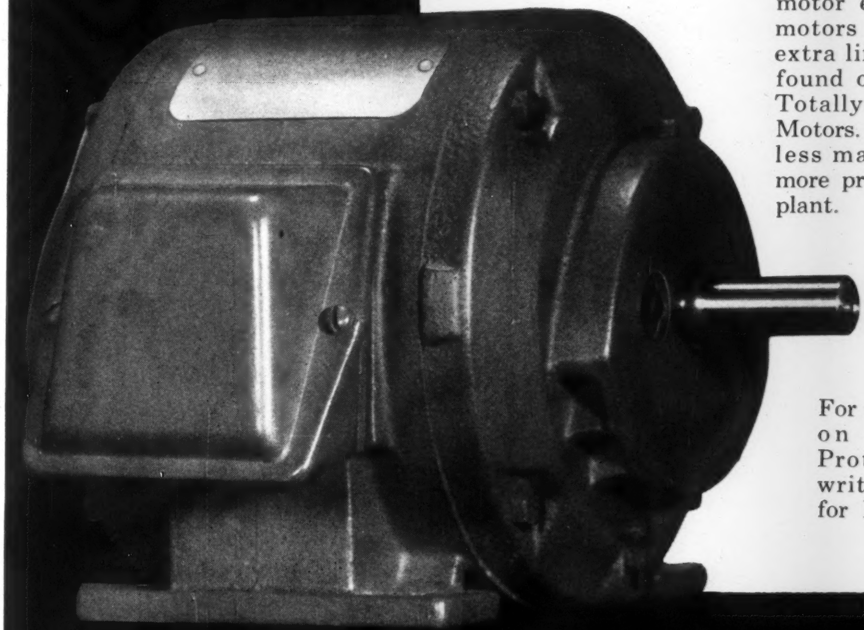
the world's only

TOTALLY-PROTECTED MOTOR

When we speak of Totally-Protected, we mean superior frame design with rigidity for heavy load conditions. We mean Metermatic bearing lubrication, acid and oil-proof insulation system, and motor leads, labeled and sealed in neoprene.

Totally-Protected means all this and more, but most of all it means a new concept of motor design and construction.

This Totally-Protected concept brings you a new motor efficiency. These motors have a built-in extra life—an extra life found only in Reliance Totally-Protected A-c. Motors. You profit from less maintenance and more production in your plant.



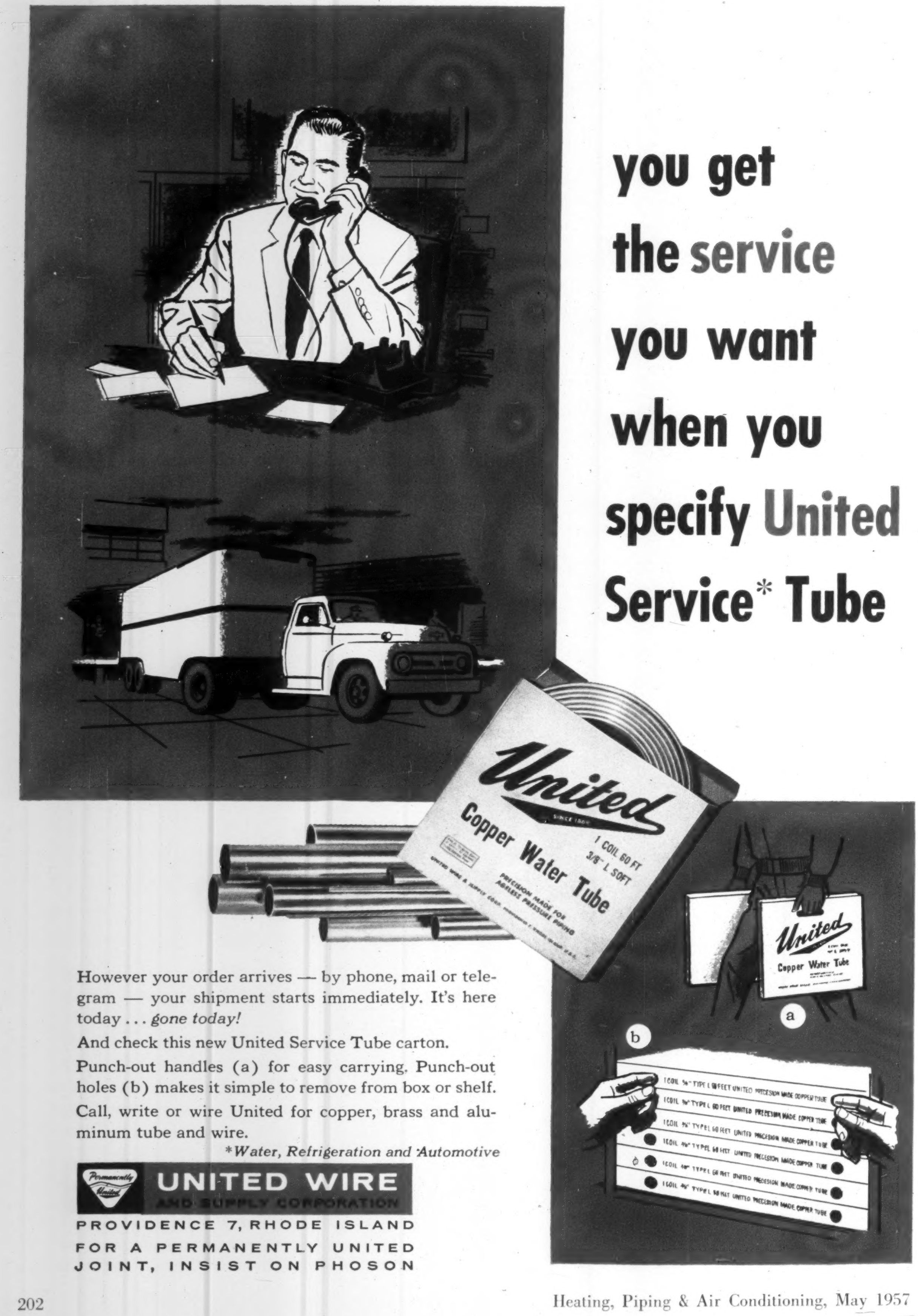
For more information on this Totally-Protected concept, write to Dept. 365-A. for Bulletin B-2401.

(B-1543)

RELIANCE R ELECTRIC

AND ENGINEERING COMPANY

CLEVELAND 17, OHIO · CANADIAN DIVISION: WELLAND, ONT.
Sales Offices and Distributors in Principal Cities


United
SINCE 1909
Copper Water Tube
1 COIL 60 FT
3/8" L SOFT
PRECISION MADE FOR AGELESS PRESSURE PIPING
United
Copper Water Tube
a
b
1 COIL 5/8" TYPE L 60 FEET UNITED PRECISION MADE COPPER TUBE

you get the service you want when you specify United Service* Tube

However your order arrives — by phone, mail or telegram — your shipment starts immediately. It's here today . . . *gone today!*

And check this new United Service Tube carton.

Punch-out handles (a) for easy carrying. Punch-out holes (b) makes it simple to remove from box or shelf.

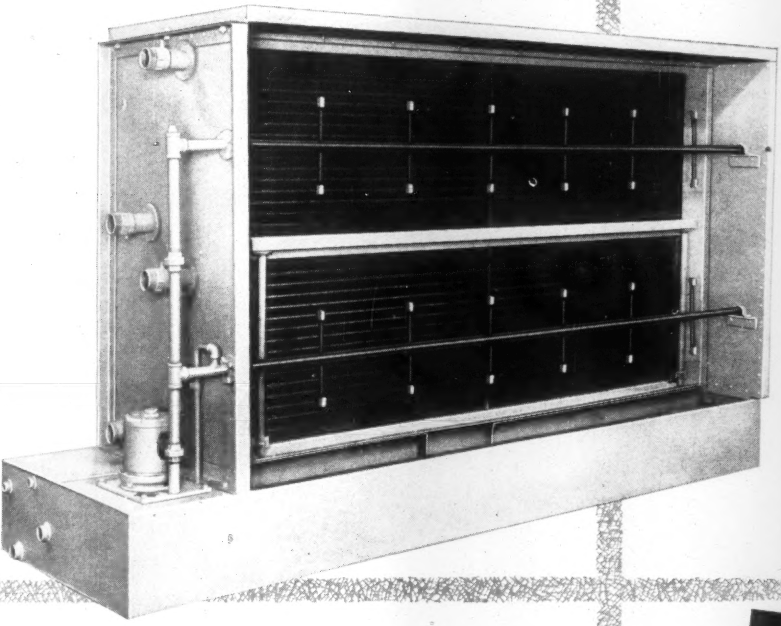
Call, write or wire United for copper, brass and aluminum tube and wire.

**Water, Refrigeration and Automotive*

UNITED WIRE
AND SUPPLY CORPORATION
PROVIDENCE 7, RHODE ISLAND
FOR A PERMANENTLY UNITED
JOINT, INSIST ON PHOSON

Marlo

Coil Type Spray Dehumidifier



washing
cleaning
humidifying
dehumidifying
heating & cooling

Air Volumes from 600 to 76,000 cfm

Simplified selection from 327 sizes

Custom units to specifications

Quality Construction in Every Feature . . .

Get the complete story . . . send for Bulletin No. 3754 with

- Photographs
- Dimensions and Capacities
- Construction Details
- Performance Characteristics and other information

Marlo
MODEL—SD
COIL-TYPE
SPRAY
DEHUMIDIFIER

AIR CONDITIONING FOR ALL SEASONS

- SIMPLIFIED SELECTION from 327 sizes
- FACE AREAS from 1 to 128 sq. ft.
- COIL ARRANGEMENTS from 1 to 3 high, also 1 and 2 wide
- CASING DIMENSIONS from 2 to 17 ft. wide and 1 to 10 ft. high
- CUSTOM UNITS to specifications

MARLO HEAT TRANSFER

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SAINT LOUIS 10, MISSOURI

Quality Air Conditioning and Heat Transfer Equipment since 1925

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Please send me Bulletin No. 3754 on Marlo Coil Type Spray Dehumidifier

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THE MARK OF QUALITY

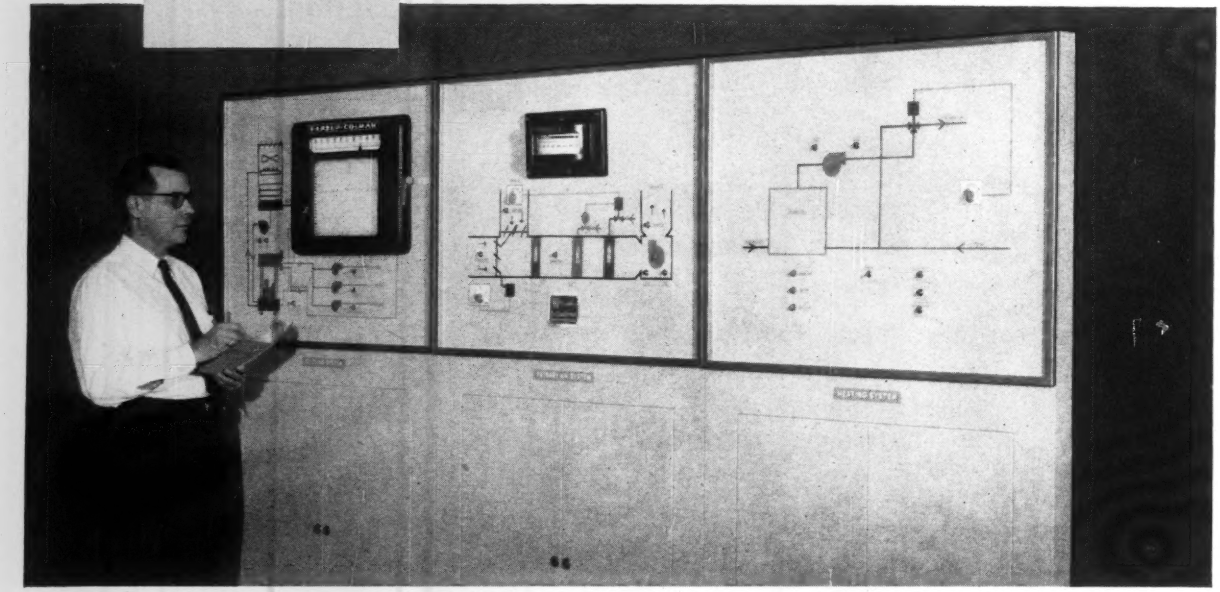
BARBER
COLMAN

Electrionic Control Centers

1- provide visual supervision of entire heating and air conditioning system and other mechanical or electrical functions

2- provide automatic control

3- reduce installation and operation costs



The most advanced *and* most practical control system for buildings today is the Barber-Colman "Electrionic" CONTROL CENTER.

It is a system that provides the central location of "Electrionic" components to automatically control and synchronize automatic heating, air conditioning, and many other functions of a building's mechanical and electrical systems. Being custom designed and prefabricated as the nerve center of the control system, a CONTROL CENTER cuts installation costs and adds many new and desirable features.

For the heating and air conditioning system, CONTROL CENTERS may incorporate, as illustrated above, schematic illustration for visual supervision . . . remote control point adjustment of space, duct and flow temperatures . . . and remote temperature indication and recording for reporting and compiling a record of the system's performance. Engineers and architects, who know, have come to recognize the "Electrionic" CONTROL CENTER as a complete control package that will improve the performance of any air conditioning system and many other types of mechanical and electrical equipment. Saves time in both supervision and maintenance.

Contact your nearby Barber-Colman Field Office for details. Remember that only Barber-Colman combines skills in both air distribution and automatic controls for *undivided* responsibility.

Electrionic Control Centers
Barber-Colman Company

ELECTRIONIC CONTROL CENTERS BULLETIN

Write for this eight-page color brochure giving detailed information on applications, advantages, functions, and design. Contains photos, drawings, typical schematics, suggested specifications. Write for your free copy of F-8031.

BARBER-COLMAN COMPANY

Dept. Q, 1379 Rock Street, Rockford, Illinois • Field Offices in principal cities

Automatic Controls • Air Distribution Products • Small Motors • Industrial Instruments • Aircraft Controls • Electrical Components • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

Snap!..and 3 ft. of duct is insulated with SNAP*ON

New idea! — insulate high-velocity round ducts with Snap*On pipe insulation, the one-piece pipe insulation of molded fine glass fibers. Just spread the single seam . . . snap it on the duct . . . seal the vapor barrier seams . . . and that's *that*.

This new Snap*On method is becoming increasingly popular because (1) you save time on installation (2) Snap*On is thermally superior to *any* other duct insulation on the market (3) the finished job is neat in appearance and absolutely uniform in thickness — no bulges, no "thin spots".

Snap*On in diameters up to 33" and with vapor barrier already adhered is available through Gustin-Bacon's nation-wide network of distributors.

*Trademark Reg.

SEE SWEET'S FILE OR CALL YOUR LOCAL DISTRIBUTOR LISTED UNDER "G-B INSULATIONS" IN THE YELLOW PAGES.

GUSTIN-BACON

Manufacturing Company GUSTIN gb BACON

Thermal and acoustical insulations • Pipe couplings and fittings.

220 W. 10th ST., KANSAS CITY, MO.

Fast fabrication of fitting covers is accomplished by miter-cutting Armaflex.

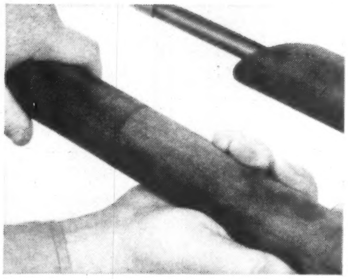
Flexible insulation goes on fast over hot and cold lines

Installation time on residential and commercial hot and cold water, heating, and air-conditioning lines can be cut 50% or more with Armstrong Armaflex®. This highly flexible insulation slips right over iron pipe or copper tubing, follows contours without any special cutting or fitting. If lines are in use, simply slit Armaflex lengthwise, snap in place, and seal with Armstrong 520 Adhesive.

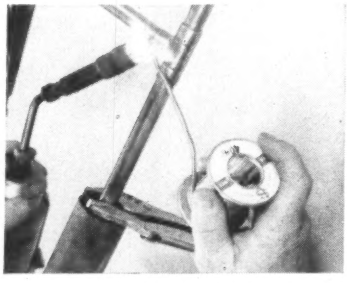
No cold line vapor barrier is needed to keep Armaflex dry when used within its recommended temperature and humidity limits. The material's foamed plastic composition completely seals out moisture and air. Highly efficient Armaflex saves heat on hot lines to 200° F.

Flexibility and resilience of Armaflex allow easy application. Waste is negligible. Fitting covers are easily fabricated from miter-cut pieces. Armaflex is available in 6′ lengths, for pipes and tubing up to 3⅛″ o.d.

Send for free booklet giving complete details on this new insulation. Armstrong Cork Company, 2005 Sherman Street, Lancaster, Pennsylvania.



Easy to install, Armaflex can be slipped right over piping. A talc coating inside the covering speeds application.



Self-extinguishing Armaflex is completely safe to apply before sweat fittings are made in copper tubing.

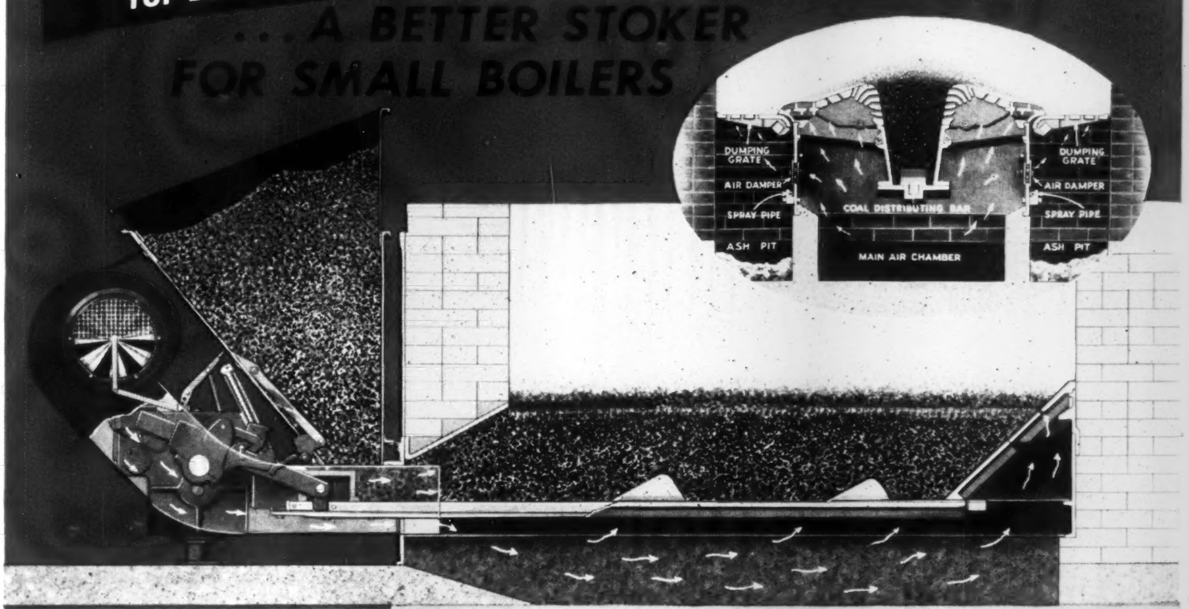
Armstrong

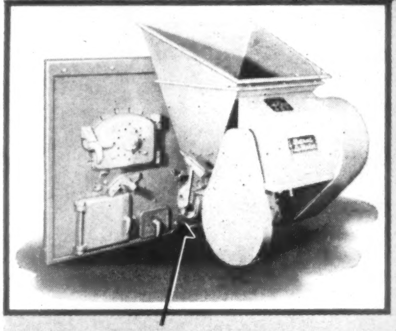
INDUSTRIAL INSULATIONS

BURN COAL the Modern Way for Economy

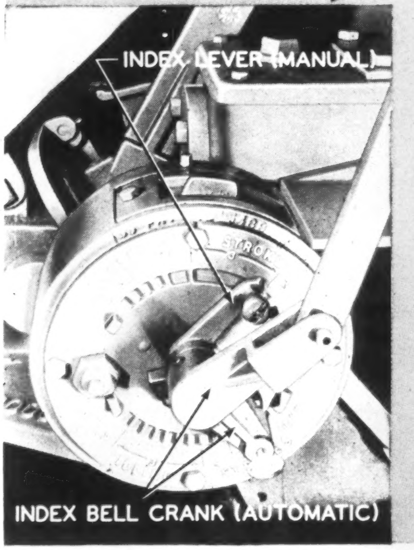
DETROIT LOSTOKER

... A BETTER STOKER FOR SMALL BOILERS





DETROIT ADJUSTABLE FEED



Many Sizes—3,000 to 12,000 pounds steam per hour. Readily applied to new or old boilers. Save coal—eliminate smoke.

The Detroit LoStoker is a plunger type underfeed, mechanically driven, side cleaning stoker sturdily built for long trouble-free service.

LOSTOKER FEATURES INCLUDE:

PLUNGER FEED—Long experience has proved this to be the most dependable type of coal feed.

HEAVY DUTY, MECHANICAL DRIVE—Machine cut worms and gears, mounted in roller bearings, run in oil. Motor or steam turbine operated, requires little power.

HIGH TUYERES—Supply more air toward center of retort, reducing coking tendency, increasing burning rate and improving efficiency.

INTEGRAL FAN—Fan and stoker driven by a single motor or turbine. LoStokers are easy to install.

CONTROL—Thirty-two different coal feeding rates. Optional are "Start and Stop" or "Fully Automatic," with the "Adjustable Coal Feed Control." Air supply in either case is proportioned to coal feed.

BRICKSET or FIREBOX APPLICATIONS

LoStokers may be applied in brick setting to all types of water tube, tubular and firebox boilers. Where Furnace volume permits, a LoStoker may be installed directly in the firebox, without front and sidewall brickwork. LoStokers are only one of several types of our underfeed and overfeed spreader stokers.

Write for recommendations. No obligation.

DETROIT STOKER COMPANY

MAIN OFFICE AND WORKS • MONROE, MICHIGAN
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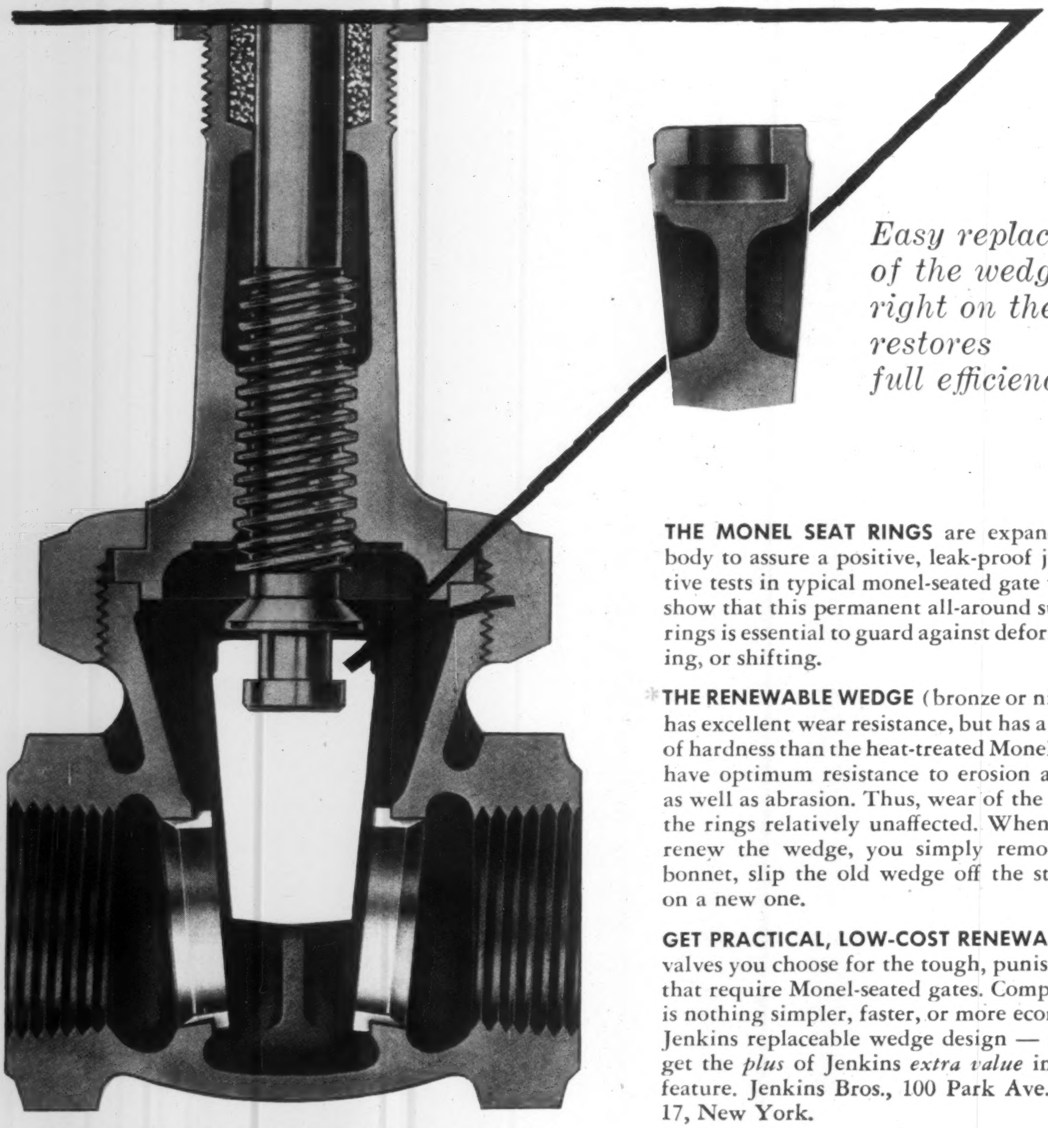
In JENKINS Monel-seated Bronze Gates

THE WEDGE* TAKES THE WEAR – *and spares the rings*



Easy replacement
of the wedge only –
right on the line –
restores
full efficiency

THE MONEL SEAT RINGS are expanded into the body to assure a positive, leak-proof joint. Exhaustive tests in typical monel-seated gate valve services show that this permanent all-around support of the rings is essential to guard against deforming, loosening, or shifting.

***THE RENEWABLE WEDGE** (bronze or nickel alloy) has excellent wear resistance, but has a lower degree of hardness than the heat-treated Monel rings, which have optimum resistance to erosion and corrosion as well as abrasion. Thus, wear of the wedge leaves the rings relatively unaffected. When necessary to renew the wedge, you simply remove the valve bonnet, slip the old wedge off the stem, and slip on a new one.

GET PRACTICAL, LOW-COST RENEWABILITY in the valves you choose for the tough, punishing services that require Monel-seated gates. Compare . . . there is nothing simpler, faster, or more economical than Jenkins replaceable wedge design — and you also get the *plus* of Jenkins *extra value* in every other feature. Jenkins Bros., 100 Park Ave., New York 17, New York.

***MADE WITH BRONZE OR NICKEL ALLOY WEDGE**

The bronze wedge provides lasting economy for most applications. The nickel alloy wedge provides extra resistance where rapid wear and corrosion are factors.

JENKINS BRONZE GATES WITH MONEL SEAT RINGS

200 psi	300 psi
Fig. 270-U, Bronze Wedge	Fig. 280-U, Bronze Wedge
Fig. 270-UN, Nickel Alloy Wedge	Fig. 280-UN, Nickel Alloy Wedge
Fig. 270-UL, Bronze Wedge, U.L. approved for L.P.G. Services	**350 psi** Fig. 280-UX, Bronze Wedge

JENKINS BRONZE GATES INCLUDE 40 DIFFERENT PATTERNS

125 • 150 • 200 • 300 • 350 psi SOLID WEDGE • SPLIT WEDGE
SCREWED • FLANGED • SOLDER END • SOCKET END QUICK OPENING

Call your local Jenkins Valve Distributor for complete information.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

EQUIPMENT DEVELOPMENTS...

For reviews of Recent Trade Literature see Page 276

Fan-Coil Unit . . .

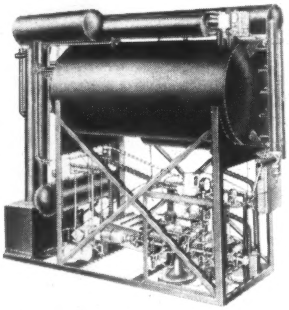
. . . for suspended installation in commercial, industrial applications—*Mueller Climatrol, Dept. HPAC, 2005 W. Oklahoma Ave., Milwaukee.*

Unit designed to operate with remote air or water cooled condensing units. Available in 2, 3, 5, 7½ ton capacities. Fan is centrifugal type. Cabinet is 28 in. long, 22 in. wide, 11 in. long. Recommended by company for where floor space is at premium.

Integral Finned Tube . . .

. . . redesigned for higher heat transfer rates—*Reading Tube Corp., Dept. HPAC, Empire State Bldg., New York* 1.

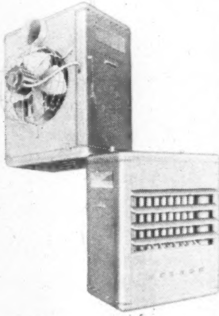
"Readi-Fin" will increase heat transfer rate more than 20 percent, says company. Is offered in two types. Type "W/H" available in long lengths, either plain or with finned ends. "S/T," an extended surface tube, may have ends finned, stripped or plain.



Water Chiller . . .

. . . with self contained control unit—*Servel, Inc., Dept. HPAC, Evansville, Ind.*

25 ton chiller uses water as refrigerant, lithium bromide as absorbent, steam as source of energy. Control system, manufactured by *Spence Engineering Co., Inc., Walden, N.Y.*, has regulating valve with four control pilots designed to provide throttling action to admit steam at rates 50 to 100 percent of chiller capacity as well as on-off control. Chiller need only be connected to sources of condensing and chilled water, steam and electricity to be put into operation, says company.



Gas Unit Heater . . .

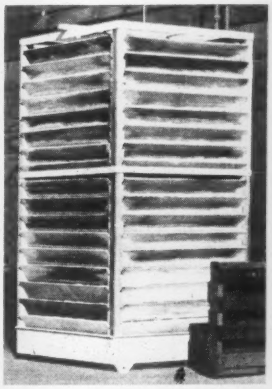
. . . with "modern" design—*Reznor Mfg. Co., Dept. HPAC, Mercer, Pa.*

Cited feature of unit is automatic two-speed fan control. All controls, now located in one group within cabinet, are reached for installation, service by removing access panel on side of cabinet. Fan motor mounted directly to wire fan guard. Company's "Flexi-Temp" control system optional on 25,000, 50,000, 75,000, 100,000 Btu suspended models.

Room Air Conditioners . . .

. . . with "Clean-Air Sentry" feature —*York Corp., Dept. HPAC, York, Pa.*

Is said to solve problem of clogged, dirty filters. Bright red light winks on when filter needs attention; stays on until filter cleaned or replaced. Line includes 13 units in capacities ½ to 2 hp.



Cooling Towers . . .

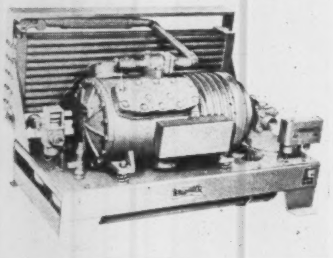
. . . with "bolt-free" construction—*Dover Mfg. Co., Dept. HPAC, 3117 Weatherford Ave., Independence, Mo.*

Can be easily knocked down for installation in hard-to-reach spots—entire unit can be erected in 20 min using screwdriver, says company. Cited construction features: basin is one-piece, leakproof unit of hot-dip galvanized steel; crown and tie-rod also hot dipped to prevent rusting; louvers are of "clear all heart" redwood. Available in sizes 2 to 225 tons.

Roof Exhauster . . .

. . . designed to meet demands for high performance, eye appeal—*Greenheck Fan & Ventilator Corp., Dept. HPAC, Schofield, Wis.*

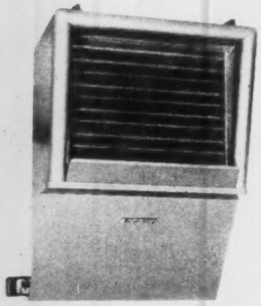
In axial, centrifugal flow types. Constructed of heavy gage aluminum with ball bearing type motor. Motor cooled by outdoor air. Rubber vibration isolators designed for each size unit, motor speed. Dynamically balanced aluminum fan blades engineered for quiet operation. Large exit area reduces exit losses, increases efficiency, says company.



Condensing Units . . .

. . .for small commercial air conditioning installations—*Brunner Div., Dunham-Bush, Inc.,* 26 *Fisher St., Utica, N.Y.*

Line of semi-hermetic units expanded to include 5, 7½ hp models. 5 hp units are four cylinder, may be cooled by air, water or combination. Available in fluorinated hydrocarbon refrigerant No. 12 models for high, commercial or low temperature applications. Semi-sealed 7½ hp units (shown) with refrigerant No. 12 available for high and commercial temperature applications, and for low temperature application with refrigerant No. 22. These six cylinder units are water cooled.



Automatic Defrost . . .

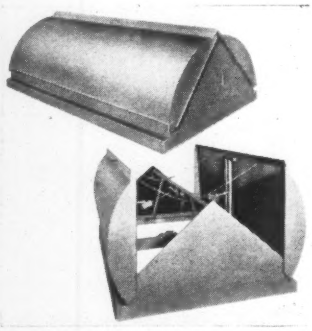
. . .engineered to combine simplicity of electric defrosting with frost removal efficiency of hot gas—*Tenney Engineering, Inc., Refrigeration Div., Dept. HPAC,* 1090 *Springfield Rd., Union, N.J.*

Independent of condensing unit, "Defrostolator" produces hot gas electrically, circulates it by means of simple, natural cycle, says company. Hot gas produced by same refrigerant used in normal refrigeration. In five models ranging 3700 to 17,800 Btu per hr.

Air Conditioners . . .

. . .for restaurants, stores, barber and beauty shops, offices—*Westinghouse Electric Corp., Dept. HPAC, P.O. Box* 868, *Pittsburgh* 30.

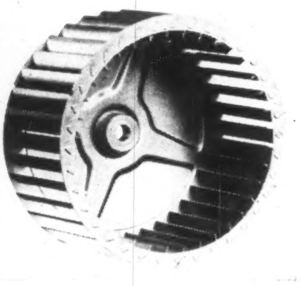
"Style-Master" units available in capacities to 70,000 Btu in steps of 3000 Btu per hr. Choice of capacity ratings made possible by use of interchangeable coils, condensers, says company. Cited feature of units is combination of colors said to harmonize with any interior. Additional color provided with "Choose-n-Change" panels.



Fire Relief Roof Vent . . .

. . .for permitting escape of smoke, heat, gases in event of fire—*Swartwout Co., Dept. HPAC,* 18511 *Euclid Ave., Cleveland* 12.

"Pyrojector" installs, operates above roof line. Two double-wall dampers are opened outward by coil springs when fusible link melts at 212 F. Creates 28 sq ft roof opening. Relief near fire source helps limit horizontal spread of flames, makes fire fighting more effective by locating flames, says company. Can be used for extra ventilation in good weather.



Blower Wheels . . .

. . .designed to provide high performance for given space occupied in air conditioning, heating, ventilating units—*Torrington Mfg. Co., Dept. HPAC, Torrington, Conn.*

"Tab Lock" wheel's space efficiency provided by individually bladed construction, in which increased delivery is achieved with blades that are deeper and with wider working area in given overall width and diameter, says company. 36-bladed units available in 10 models, with diameters of 6 5/16, 7 3/32, 8 in. and various widths. 44-bladed model with 10¾ in. OD and 1 31/32 in. width also available.

Air Compressor . . .

. . .available in 1½, 2 hp sizes—*Ingersoll-Rand Co., Dept. HPAC,* 11 *Broadway, New York* 4.

"Channel-Flo" two-stage, 200 psig packaged unit includes motor-compressor, cushioned rubber mounting on vertical tank, interconnecting piping and fittings, automatic start-stop control. Compressor flange-mounted directly on driving motor, said to provide appreciable saving in floor space. Can also be mounted on shelf, side wall or overhead bracket with air receiver located in out-of-the-way space, says company.

Motors . . .

. . .designed particularly for hydraulic pumps—*U.S. Electrical Motors, Inc., Dept. HPAC, Box* 2058, *Terminal Annex, Los Angeles* 54.

Units, in dripproof, totally enclosed, explosionproof designs, incorporate face type registered bracket for mounting pump on motor. Motors available to 125 hp. Cited features:

TECHNICAL *Bulletin* NO. 38

Tests by the National Bureau of Standards

GET IT FREE!

CONCLUSIONS:

(Exact Quotations)

"1. **Condensation will not occur** in wooden floors over crawl spaces, where **reflective insulation** is installed in a normal fashion with some small percentage of openings which permit air to pass through."

"2. The **temperatures** of such insulation surfaces should remain above the dew point of the air in contact. The relative humidities of the air in the spaces within the floor structure are unaffected by opening or closing the crawl space."

"3. A perfect vapor seal by means of the reflective insulation, or other material, is neither necessary nor desirable and would probably permit condensation to occur in some cases. Perforations, of the order used, assure air flow upward through the floor structure, and provide drainage for water which might leak through the floor from above."

"4. Reflective insulation produces a **marked rise in the temperatures of the floor surface."**

EXCERPTS

(Exact Quotations)

Severe Tests With Sudden Cooling

"Eight tests were made with a **single layer of reflective** insulation, six with steady ambient temperatures of **32° F.** and **10° F.,** and two in which the test box was preheated and then the ambient temperature reduced as rapidly as possible to determine whether a **sudden cooling** of the reflective insulation would cause moisture to condense on the upper side. **Three tests** were made with **two layers of reflective** insulation under the floor and with steady ambient temperatures at 25° F. or 32° F."

"Condensation never occurred on the upper surface of **either layer** of the reflective insulation **under all of the varied conditions** of these tests. The temperature of these surfaces was observed to be above the dew point of the contacting air under all test conditions."

Dew Point Never Reached

"At steady conditions with average outside air temperatures between 30.9 and 32.2 degrees F., the temperatures of the upper surface of the insulation remained above the dew point of the air to which it was exposed by 9.9 to 18.7 degrees F. with one layer of insulation and by 12.5 to 15.7 degrees F. with two layers of insulation."

"Under conditions where the temperature of the ambient air was reduced rapidly, and with one layer of insulation, the temperature of the upper surfaces of the insulation dropped with the dew point of the air to which it was exposed. When the outside temperature dropped from 56.3° F. to 31.4° F. in six hours, the insulation temperatures remained **above the dew point by 14.6 to 10.3° F.** When the ambient temperature was dropped from **39.2° F. to 9.2° F.** in 24 hours, the insulation temperatures remained above the dew point by 12.9 to 5.8° F."

"As a further indication of lack of condensation, the upper surface of the upper layer of insulation was **deliberately fogged** during several of the tests. Each time the surface of the insulation was so fogged, the condensed **moisture disappeared within 5 to 10 minutes."**

"The results indicate that condensation would not occur between the floor and the insulation or between the two layers of insulation during any probable winter condition."

Send the coupon for a free copy of this remarkable and interesting Technical Bulletin No. 38.

Infra Insulation Inc., 525 Broadway, N.Y.C. Dept. H-5
Please send National Bureau of Standards Booklet No. 38.

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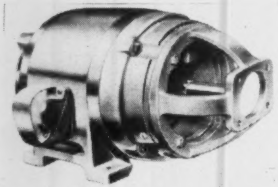
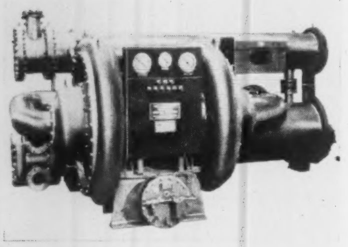


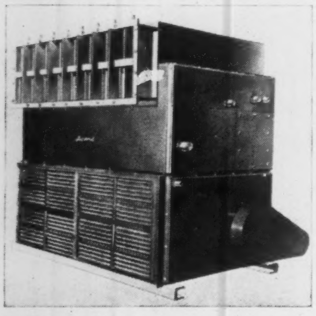
asbestos protected windings, normalized castings to retain accuracy of machining, relubricated ball bearings by "Lubriflush" transverse method to remove old grease.



Refrigeration Unit . . .

. . . in sizes 100 to 500 tons capacity —*Worthington Corp., Dept. HPAC, Harrison, N.J.*

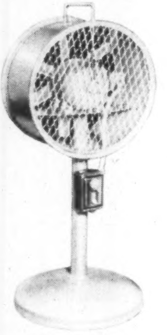
Hermetic centrifugal unit designed for any air conditioning installation where chilled water is used. Is said to be easily adaptable to any type of building. System utilizes two-stage, balanced, vaneless diffuser type compressor engineered for high efficiency, economy, ease of installation.



Air Conditioners . . .

. . . designed for buildings where heating, cooling are required simultaneously—*Acme Industries, Inc., Dept. HPAC, Jackson, Mich.*

Multizone "Flow-Temp" units engineered to deliver either filtered, cooled and dehumidified air, filtered, heated and humidified air, or mixture of both in any proportion to as few as 6 or as many as 22 different zones in a building. Capacities range 1370 to 21,000 cfm.



Man-Cooling Fan . . .

. . . for both product and comfort cooling in industrial applications where continuous, powerful flow of air is required—*Chicago Blower Corp., Dept. HPAC,* 9863 *Pacific Ave., Franklin Park, Ill.*

"PM" axial airfoil unit has aerodynamic hub and blade design said to provide high efficiency, quiet operation. Available in 24 to 42 in. sizes with two, four, six or eight blades.

Cooling Towers . . .

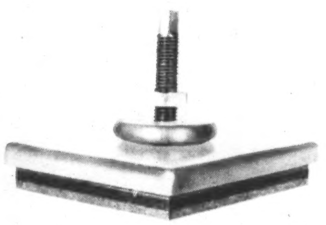
. . . in new, redesigned line—*Marley Co., Dept. HPAC,* 222 *W. Gregory Blvd., Kansas City* 14, *Mo.*

Packaged "Double-Flow Aquatowers," with nominal capacities 80, 100, 125 tons, have internally mounted motors, more efficient drift eliminators, rugged combination mechanical equipment support and water distribution piping assembly, says company.

Spray Nozzles . . .

. . . constructed of butyrate plastic—*Eastman Chemical Products, Inc., Dept. HPAC,* 260 *Madison Ave., New York* 16.

Designed to combine improved dispersal pattern with resistance to corrosion and high effectiveness against erosion. Recommended by company for application to air conditioning, industrial cooling towers. Inner surface of nozzles is "slick-smooth," and shape of inner chamber is very nearly true involute, says manufacturer. Both factors are said to reduce pressure losses to minimum, improve nozzle performance.



Machinery Mounts . . .

. . . in seven models with loading ranges 800 to 7500 lb per unit—*Unisorb Div., Felters Co., Dept. HPAC,* 210 *South St., Boston* 11.

"Level-Rite" consists of steel base unit with leveling screw and leveling plate, combined with vibration damper pad. In four sizes: 4 × 4, 6 × 6, 8 × 8, 10 × 10 in. Cited features: "Screw-Post" design by which machine is quickly, easily leveled; ease of anchoring whereby no bolts, lag screws nor cement are needed.

Air Cooled Condenser . . .

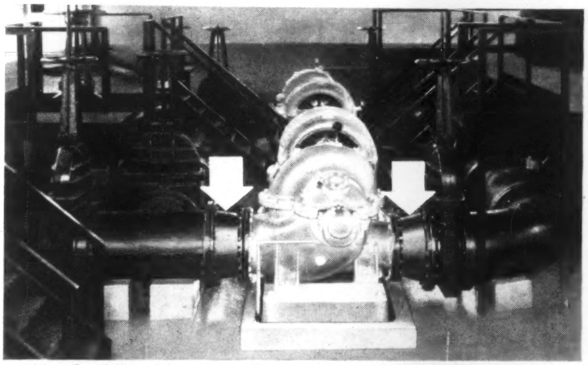
. . . redesigned externally, internally —*Airtemp Div., Chrysler Corp., Dept. HPAC,* 1600 *Webster St., Dayton* 1, *Ohio.*

5 hp "Model 1205-1" has reduced size, weight. Condenser coils located one on each side of unit. Other cited features include: single condenser blower; quick response expansion

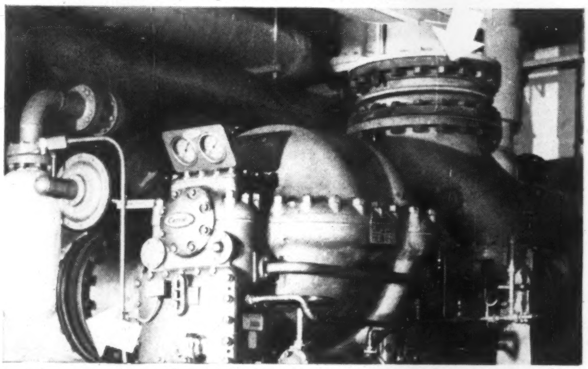
(*Continued on page 224*)

EXPANSION JOINTS

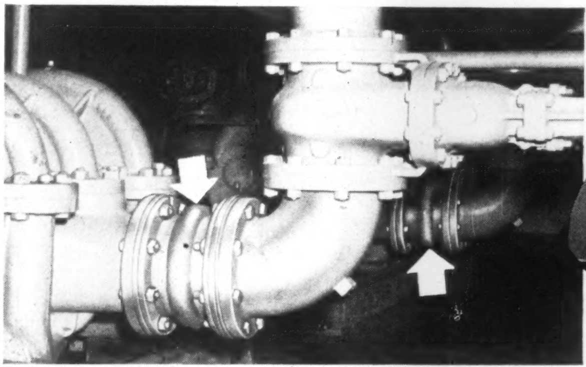
Expanding the Designer's Scope



The flexible rubber expansion joints on the centrifugal pump installations (above) are made by U. S. Rubber. They prevent stresses caused by expansion and contraction.



This compressor has U. S. Expansion Joints on the suction and discharge lines. Like all U. S. Joints, these insulate against the transfer of vibration and noise.



Piping equipped with U. S. Expansion Joint to compensate for any misalignment caused by load stresses, wearing of parts or settling of building.

U. S. Rubber Expansion Joints are resilient and therefore do not, like metal, set permanently when compressed. Constant flexing merely keeps them alive... prevents brittleness.

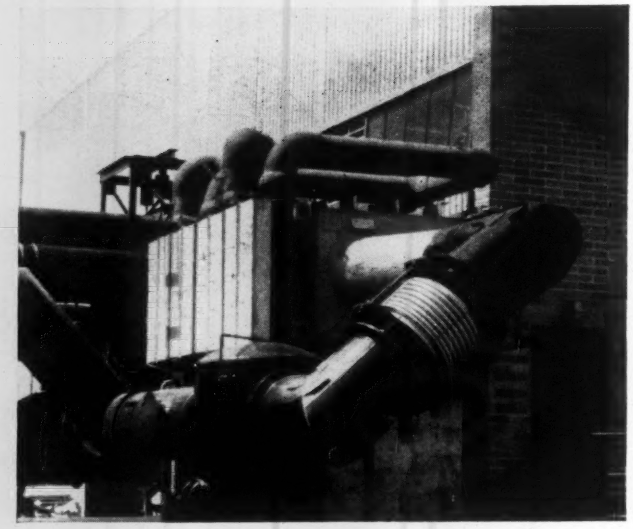
- They absorb both axial and lateral deflection far more than metal joints. Greater insulation against vibration and pump noises. No electrolysis, corrosion or erosion.
- Handle pressures from 40 lbs. to 125 lbs.
- The outside diameter of the arch is smaller than on metal joints. (Face-to-face dimensions, even with multiple arches, are smaller.)
- Weight is much less. This, plus the fact that no gasket is needed between flanges (metal joints require gaskets) results in an easier installation lowering the cost.

"U. S." was the *first* to develop expansion joints. They are at work in every kind of industry, prolonging the life of equipment in pressure or vacuum pipe systems. Some are still in service, after 30 years of operation. Obtainable at any of the 28 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y. In Canada, Dominion Rubber Co., Ltd.

For the complete technical information catalogue on the entire line of U. S. Rubber Expansion Joints, contact your nearest "U. S." District Sales Office or write us at Rockefeller Center, New York 20, New York.

Mechanical Goods Division

United States Rubber



SPECIAL EXPANSION JOINTS

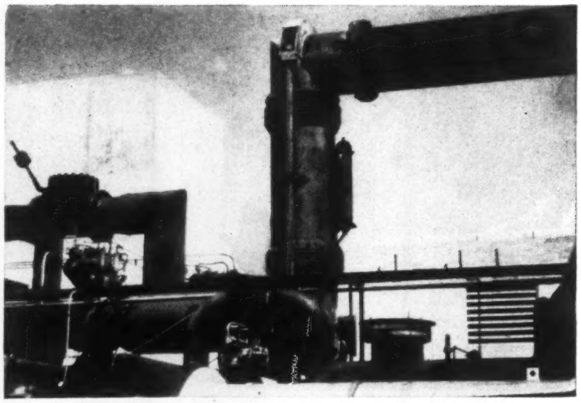
are Second Nature to

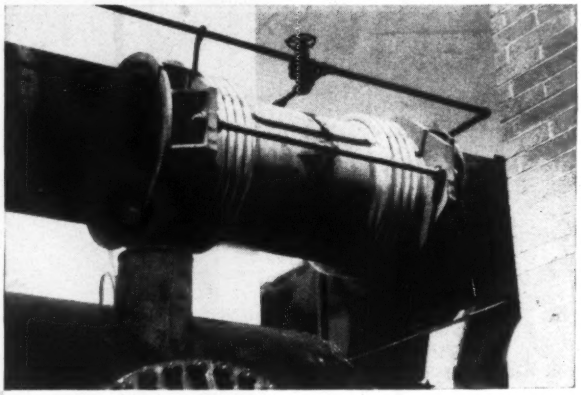
ADSCO

These photographs show installations of special ADSCO Corruflex Expansion Joints at the Fairchild Engine Division, Fairchild Engine & Airplane Corp., Deer Park, Long Island, N. Y. All joints are designed to absorb lateral motion only, except that the long universal joint, right center, also absorbs any axial growth of its own. All joints are equipped with internal sleeves to smooth out the flow of high-temperature air being carried by the piping systems. They are not standard joints; they are specially engineered, specially manufactured.

A few years ago, when ADSCO was pioneering packless joints for special work, a job like this took considerable engineering and manufacturing time... because it was a new field. But since then, ADSCO has acquired so much experience from so many special orders that special jobs like the Fairchild one are truly "second nature".

Special applications of packless joints are developed carefully but not laboriously. Experience enables ADSCO engineers to get the work out easily and with confidence. Consult them next time you have a special piping problem.





REMEMBER!

Use ADSCO Expansion Joints instead of Pipe Bends because of these advantages.

1. LESS HEAT LOSS
2. LESS PRESSURE DROP
3. LESS SPACE
4. LESS COST

AMERICAN DISTRICT STEAM DIVISION
YUBA MANUFACTURING COMPANY
20 MILBURN ST. BUFFALO 12, N. Y.

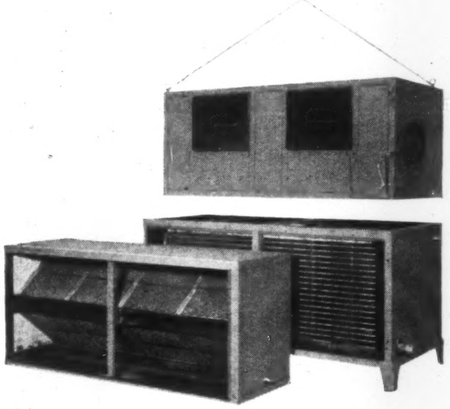
THE KENNARD *Engineered* LINE

Costs Less Installed!

Kennard Corporation planned each unit to be as complete as possible and "job ready". No hidden costs—no loss—no waiting.

Buy Kennard Engineered Air Conditioning Equipment and be sure of a profit.

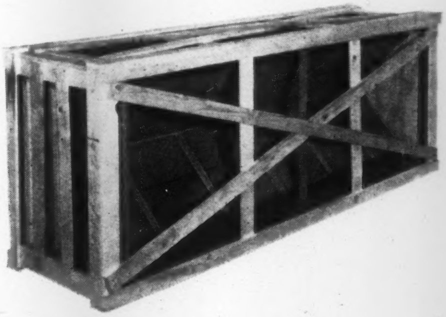
Look at these reasons...



VERTICAL A.C. UNIT

- **Each Section is Completely Factory Assembled**—A big saving of field man-hours and done by factory experts.
- **Each Section is Self-Supporting**—Makes for easy and quick bolting together.
- **Rugged Frame**—For less costly handling and rigging. The rugged welded framework gives more strength than the bolted pan type.
- **Lifting Eyes for Easier Hoisting**—This is a big help in many-storied buildings, or just rigging in the equipment room.
- **Expansion Valves are Factory Mounted and Piped**—This too represents a big saving on the job.
- **All Mating Parts are Factory Fit**—The bolt holes are jig checked before leaving the assembly line.
- **Compact Size**—Designed for space saving, but the correct size for the individual application.

- **CRATED**—Yes, Kennard crates all pieces, not just skidded. Proper Crating assures . . .
  Protection against damage in shipment.
  Protection against damage on the job.
  Saves delays. **SAVES MONEY.**
- **Reliable Shipping Schedules**—Usually a contractor's biggest headache. Kennard is proud of its record of **SHIPPING ON TIME.**

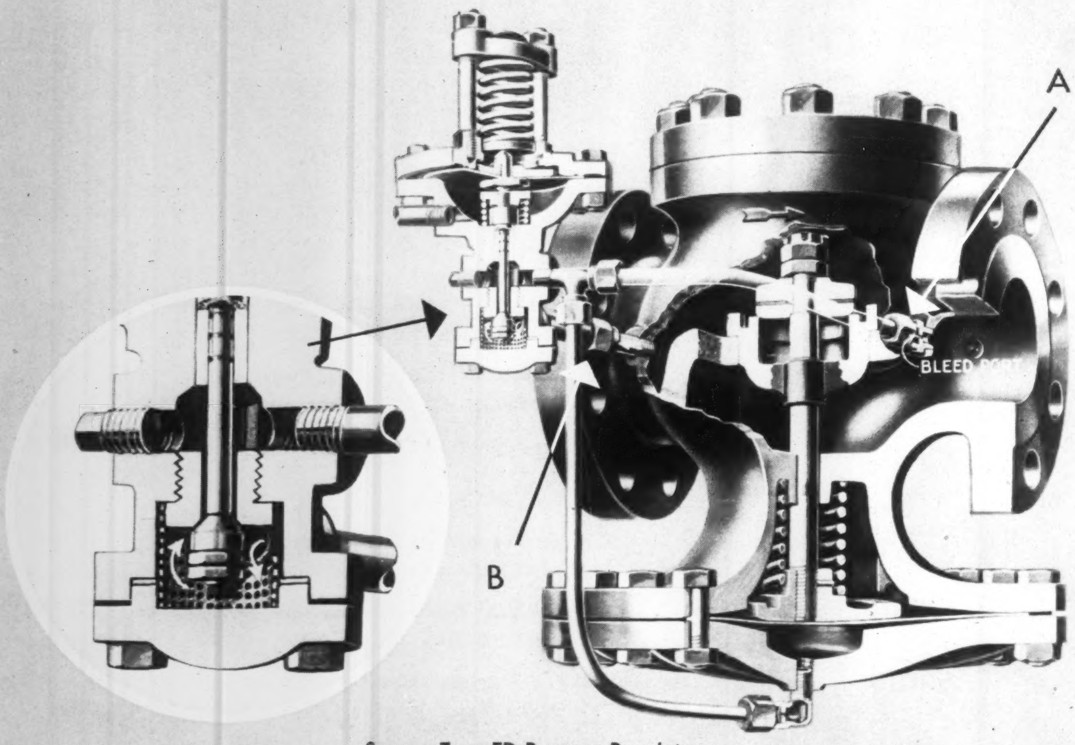


KENNARD CORPORATION
1817 HANLEY RD. • ST. LOUIS 17, MO.

Representatives in
All Principal Cities

VALVE TIPS:

Advantages of External Pilots in Automatic Regulating Valves



Spence Type ED Pressure Regulator

"Maintenance-free, trouble-free, install-and-forget." They're all pretty phrases, but every engineer knows from experience they don't apply to regulating valves. Any valve designed to control temperatures or pressures within tight limits can be affected by dirt or other foreign matter in steam lines.

One advantage of the external pilot mounting shown above is simplified maintenance. Trouble shooting is faster, downtime is reduced, and tempers don't take such a beating. Here's why:

If trouble develops, it's easy to find out if it's in the pilot or the main valve. Just remove the tubing bend at A. A simple test, without any instruments or other equipment, shows where the trouble is.

If the trouble is in the pilot, you can remove it by disconnecting the unions at B. There's no need to take the main valve out of the line.

The quickest way to get the regulator functioning again is to install a spare pilot. This is easy — and in the Spence design it's not expensive to carry spare pilots. Spence pilots fit all sizes of Spence main valves. There's no need to stock an expensive inventory of pilots for each main valve size.

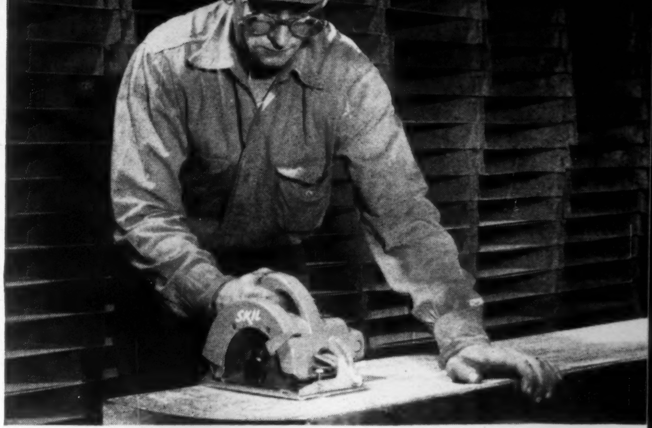
In the enlarged sectional drawing above, you can see how the strainer, seat and disc of the pilot are readily accessible by removing the blind flange.

If the trouble is in the main valve, here again inspection is easy. If there's dirt in the steam line, it may clog the bleed port or restriction orifices. In the Spence design these can be inspected and cleaned by merely removing the tubing connections. The seat and disc of the main valve can also be inspected easily by removing the top flange.

These maintenance advantages, plus other advanced design features, are available for a wide range of regulating applications. For information on Spence's wide range of different automatic regulating valves, write for your copy of Bulletin 1005.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

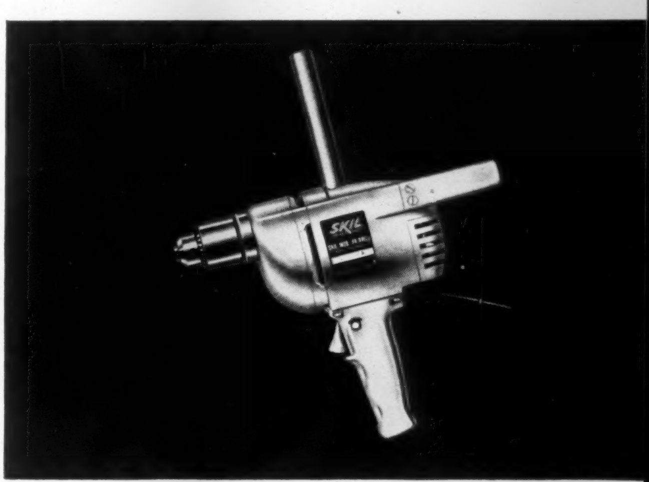
Saves one-third cutting time. Monarch Mobil Homes, Inc., St. Paul, put a SKIL Model 299 Router to an unusual test. The problem: to cut aluminum already mounted on a curved surface. Trials with other routers proved the tool would do the job but soon burned out under the strain of production metal cutting. SKIL Model 299 not only did the cutting perfectly but saved one-third cutting time!



Saves cost of heavy-duty equipment. Steel King Company, Milwaukee, needed a versatile, inexpensive portable saw to cut 22-gauge steel paneling. They tried a SKIL 7¼" Model 874 and found it made every cut necessary. Rips, cross-cuts, 45's and pocket cuts are routine in the 22-gauge steel. "Does the job, cuts down excessive material handling and costs less," say the owners of the company.

Metalworkers SAVE with SKIL Tools

Saves $100.00 per unit. Griffin Tank and Welding Service of Dallas, custom builds geographic photographic equipment. This equipment must be lightproof, weatherproof, dustproof and air tight. "When SKIL drivers were substituted for hand tools for fastening, we saved over $100.00 per unit (5 gross of #8 screws), and quality improved tremendously," says C. B. Jones, Chief Engineer.



SAVE with New ½" Drill. All new design—shorter, narrower, one pound lighter! New power for fast drilling on the toughest jobs. Improved helical gears deliver power with top efficiency. No matter what you have to drill, cut, sand or grind, there's a SKIL tool to do the job faster, better, cheaper. Let your SKIL distributor show you why. Or use the coupon below for further information.

SKIL
PORTABLE TOOLS

Made only by SKIL Corporation, Chicago 30, Ill.
Factory branches in all leading cities.

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FREE *booklet*
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In Canada:
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Toronto 9, Ontario

________Please send me name of nearest distributor.

________Please send me FREE booklet on SKIL power tools.

Name________________________Title__________

Address____________________________________

City____________________Zone____State________

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Piping &
Air Conditioning
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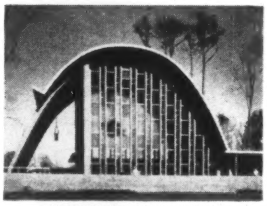
KEENEY PUBLISHING CO.   AIR CONDITIONING HEADQUARTERS

6 N. Michigan, Chicago

Specify RECO

Skilled RECO craftsman seals head of cement-lined storage heater for Jamestown Festival.



VIRGINIA'S JAMESTOWN FESTIVAL

Architects & Engrs.—Ballou & Justice, Richmond, Va.

Plumbing Contr.—Service Plumbing and Heating Co. Williamsburg, Va.

General Contractor—John W. Daniels, Danville, Va.

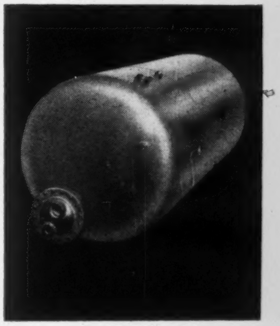
Heating & Plumbing Jobber—Noland Co., Inc. Newport News, Va.

RECO Makes Hot Water History at Virginia's Jamestown Festival

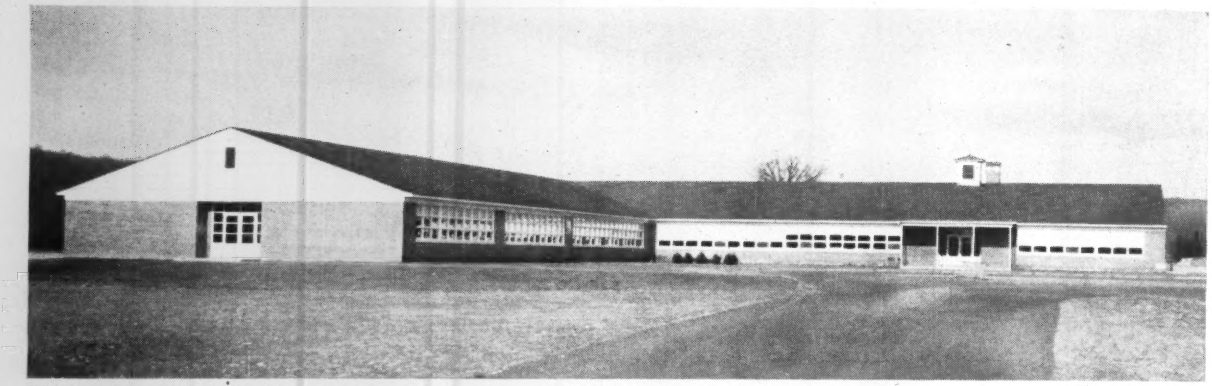
More than two million visitors will walk back 350 years through history at the Jamestown Festival celebration of 1957. But they'll never be more than a few steps away from the comforts of today. A RECO cement-lined hot water storage heater keeps plenty of piping hot water always on tap in the festival's group of administrative buildings—the Reception Center, Gift Shops, Restrooms, and Mermaid Tavern. For these same buildings, a RECO convertor supplies hot water for the forced circulation, modular type heating system.

For guaranteed quality, fair price and quick delivery on *your* next heating job—SPECIFY RECO.

Write for free catalogs and name of RECO representative nearest you today: RECO, Dept. P, 7th & Hospital Sts., Richmond 5, Va.



RICHMOND ENGINEERING CO., INC.



Woodbury, Conn., High School—Architect: Edward M. Foote, Cornwall, Conn. **Consulting Engineer:** Richard Shipman Leigh, Woodbury, Conn. **Heating Contractor:** Romaniello Bros., Waterbury, Conn. **General Contractor:** F. Buzzi & Sons, Torrington, Conn.

Combined convector and radiant heating slashes fuel costs

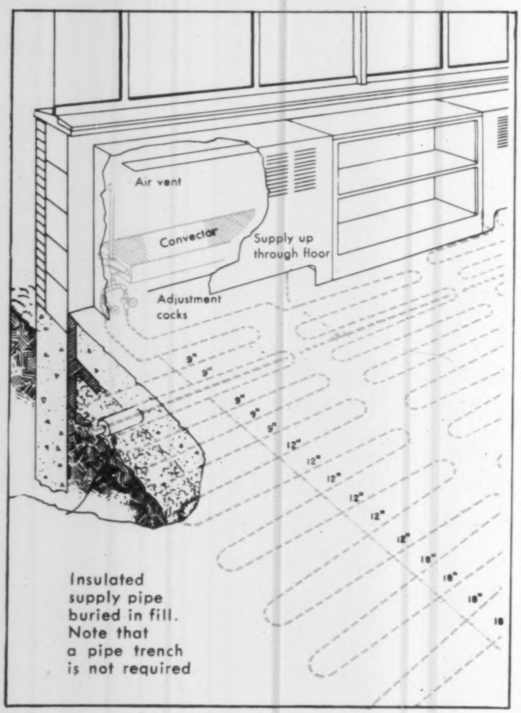
New idea in heating yields significant fuel savings. Anaconda Pre-formed Panel Grids in the floor serve as highly effective heating elements and as return lines for convectors.

Mr. Richard S. Leigh, consulting engineer, designed this combination convector and radiant heating system, and one of his most recent installations was the Woodbury, Connecticut, High School for which he specified the time-saving PG's® (Anaconda Panel Grids) and Dunham-Bush convectors.

Mr. Leigh reports that the Woodbury School has an annual fuel bill of about $1000 for heating 22,000 sq. ft. floor area. Similar schools, employing other heating methods, are spending approximately $2000 for heating an equivalent area.

IDEAL FOR SCHOOLS, HOSPITALS, OFFICES. "This combination of convector and radiant heating," continues Mr. Leigh, "is economical to install, comparing favorably with competitive 'economy' type systems. A curtain of warm air at the windows prevents cold drafts and uncomfortable temperatures at the outer walls. The copper tube floor coils provide uniform warmth throughout the room. Individual room zoning is inexpensive. Such comfort cannot be obtained by any other method of heating at so low a cost."

FOR INFORMATION on Anaconda Panel Grids, the ready-to-install copper tube coils for radiant heating in floors and ceilings, and details about this combination convector-radiant heating system, write Building Products Service. The American Brass Company, Waterbury 20, Conn. 5717

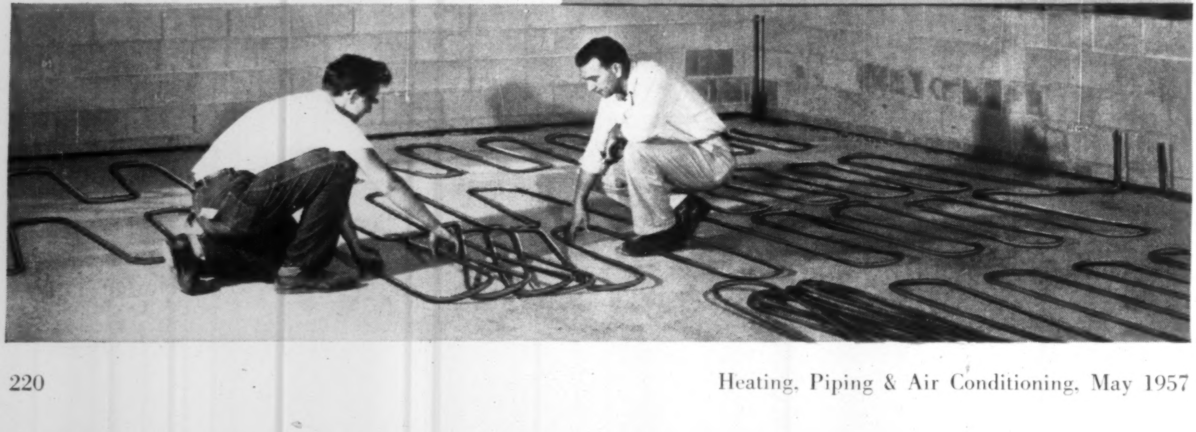


SCHEMATIC DIAGRAM of installation showing how the return line of the convector is connected to Anaconda Panel Grids.

ANACONDA®

PRE-FORMED COPPER TUBE PANEL GRIDS
FOR RADIANT PANEL HEATING

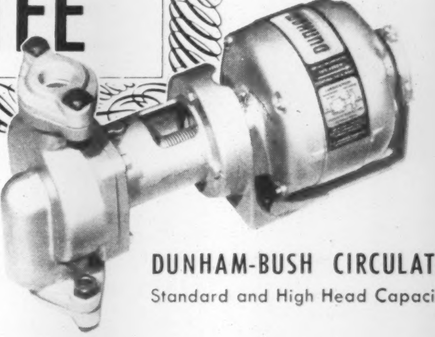
Available through distributors of Anaconda Pipe and Tube



INSTALLING the Anaconda Pre-formed Panel Grids. Note that the grids can be easily extended to variable c-c spacing to meet design requirements. See the tube spacing in diagram above—9" c-c near outside wall to 18" c-c near inside wall.

another DUNHAM-BUSH PROFIT POINTER

LIFETIME COUPLING GUARANTEE



DUNHAM-BUSH CIRCULATOR
Standard and High Head Capacities

forget about stocking or replacing circulator couplings

Anyway you figure it, you're money ahead with Dunham-Bush Circulators.

The single spring Coupling in every Dunham-Bush Circulator is *guaranteed* for the lifetime of the Circulator. No "ifs", "ands" or "buts"—you just plain don't stock replacement couplings ... don't have costly replacement "call backs". And that means more profit!

Circulator installation is quick and easy either in horizontal or vertical pipes . . . in supply mains or return lines . . . with six positions to fit any application.

And look at these additional profit-performance "proofs":

- *Vibration-proof* one-piece impeller
- *Water-proof* bearing lubrication section
- *Overload-proof* brand name motor

Insure your profit with these guarantees. Get details of the complete Dunham-Bush hot water line, now.

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Air Conditioning, Refrigeration, Heating Products and Accessories

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DUNHAM-BUSH, INC. Dept. HP
West Hartford 10, Conn.
Rush me Circulator and hot water equipment profit details (Bulletin 1551)
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Company ....
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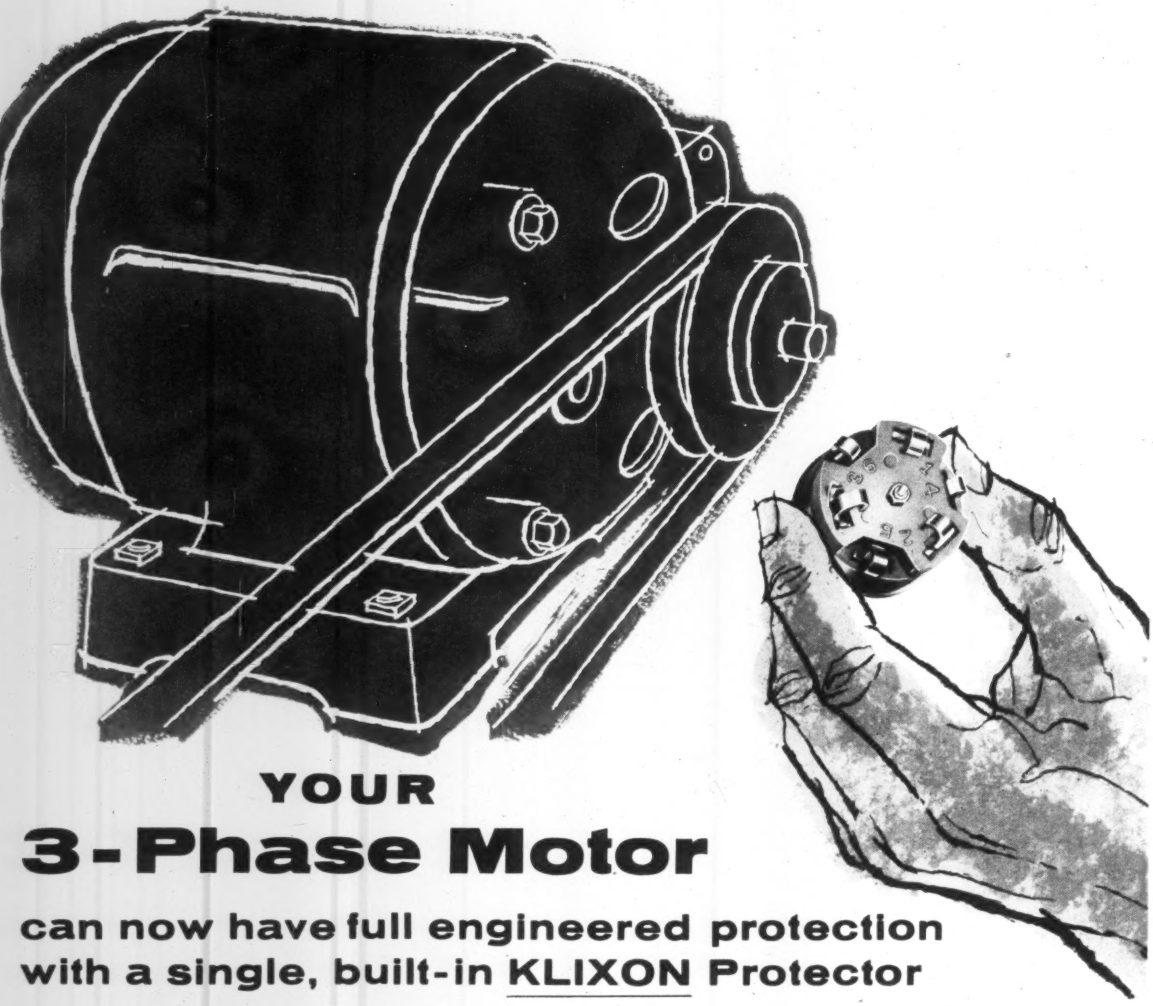
City .... Zone .... State ....



YOUR
3-Phase Motor
can now have full engineered protection with a single, built-in KLIXON Protector

PREVENT OVERHEATING CAUSED BY:

- **Prolonged overloads**
- **Single phasing**
- **Stalling**
- **Failure to start**
- **Lack of ventilation**
- **Increase in ambient temperature**
- **Plugging or reversing duty**
- **Unbalanced voltage**

Now your 3-phase Motors can have the same protection that motor manufacturers have for years engineered into single-phase motors. That's because Motor manufacturers everywhere can supply standard three-phase motors with built-in Klixon Protectors.

The result: you're assured of maximum work output with minimum down time.

Klixon 3-phase Protectors are now available for Motors ranging from fractional HP up to 7½ HP (600V).

BUILT-IN KLIXON AUTOMATIC AND MANUAL RESET PROTECTORS FOR 3-PHASE MOTORS:

- Reduce production down time
- Eliminate motor burnouts
- Minimize motor repairs and replacements
- Assure maximum motor capacity under any conditions
- Simplify motor controls

Specify and use
MOTORS WITH BUILT-IN KLIXON PROTECTORS

Get the details from your district motor salesman . . . then specify and use motors with Klixon Inherent Protectors. The additional cost is low . . . the savings high . . . the advantages really worth-while!

METALS & CONTROLS CORPORATION
Spencer Thermostat Division
3405 Forest Street, Attleboro, Mass.
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NOVELTY breaks the Life Quality Price barrier

on

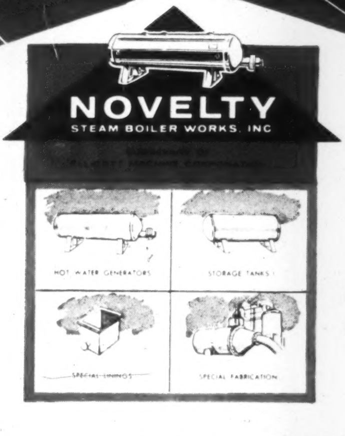
SPECIAL FABRICATION

The popular equation that a better product costs more *is now shattered!* For Novelty has broken the Life-Quality-Price barrier on Special Fabrication work with Novelon Linings.

Novelty combines the vast experience of tank and metal fabrication—with a complete range of Novelon Linings that (1) prevent corrosion, (2) protect against contamination, (3) resist heat up to 500° F., (4) outlast metals for chemical receptacles and processing vessels.

If you are planning to have vessels or systems fabricated that require the combined facilities of a modern fabricator and time-tested Novelon Linings—contact Novelty today.

- **Specify NOVELTY**
  THERE'S NO EQUAL


NOVELTY
STEAM BOILER WORKS, INC
SUBSIDIARY OF [illegible] MACHINE CORPORATION
HOT WATER GENERATORS
STORAGE TANKS
SPECIAL LININGS
SPECIAL FABRICATION

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NOW...THE TITUSVILLE

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PACKAGE UNIT

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WITH 80% PLUS

CERTIFIED EFFICIENCY!

As pioneer and master-builder of Scotch Marine type boilers, TITUSVILLE is proud to present the 3-PASS boiler-burner package unit for high and low pressure and hot water. Offering the highest efficiency obtainable, these new 3-Pass boilers provide economy in service so great as to return the entire investment cost over a few years of operation. Designed for use with any of the leading makes of burners, and for gas, oil, or gas-oil combinations, Titusville 3-Pass boiler-burner units are available in ten sizes, with heating surfaces from 358 to 3571 sq ft. Write for the facts, and a quotation on your requirements.

THE TITUSVILLE IRON WORKS CO.

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BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units
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Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters
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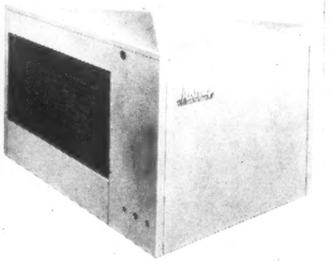
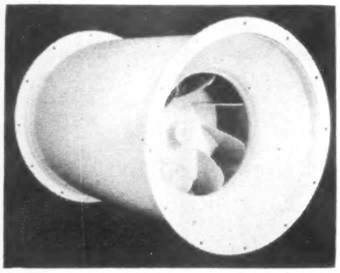
A Division of
Struthers Wells
TITUSVILLE, PENNSYLVANIA
Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement
Plants at Titusville, Pa. and Warren, Pa.
Offices in Principal Cities

EQUIPMENT DEVELOPMENTS

Continued from page 212



valve; magnetic starter with magnetic overload protection and high-low pressure cutout; mild weather control to eliminate tripouts of low pressure control during starts; 5 cylinder sealed radial compressor, equipped with crankcase heater and heater switch.



Centrifugal Fans . . .

. . .engineered to combine compactness of tubular fans, quietness of scroll centrifugals—*Dryer Electric Corp., Dept. HPAC,* 117 *Bedford Ave., Brooklyn* 11.

Recommended by company for variety of air conditioning, ventilating; industrial process applications. Efficiency curve peaked near midpoint of normal selection range nearly triples selection area, says company.

Welder, Power Plant . . .

. . .combination with increased power—*Miller Electric Mfg. Co., Inc., Dept. HPAC, Appleton, Wis.*

Now equipped with new and larger 12.9 hp engine, model "AEA-200-L" produces 225 amperes of continuous rated welding cur-

(Continued on page 229)

When it is up to you... install

O-B VALVES

their many features will give customers added faith in your judgment...

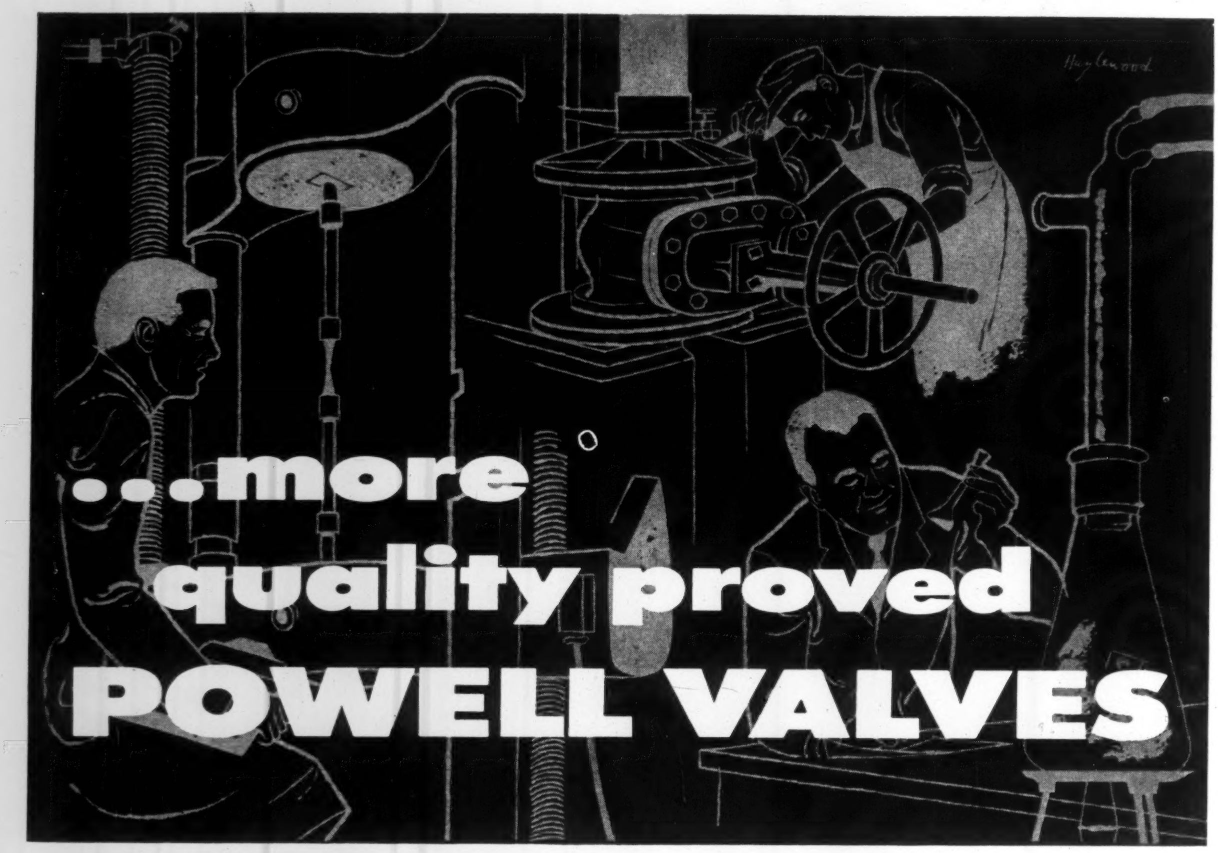
For instance, think what it means to a customer when he doesn't have to shut down a line to replace worn valve packing. With standard O-B bronze gate and globe valves — 125 lbs. WSP and above — the stem is designed so that it seals pressure within the body when the valve is full open. Repacking is quick, safe.

Ask your Ohio Brass distributor about the complete line of O-B valves.

OHIO BRASS COMPANY • MANSFIELD, O.

4728-V

125
WSP
200
WOG



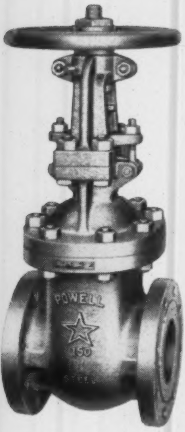


FIG. 1503—Steel O.S.&Y. Gate Valve for 150 Pounds W.S.P.

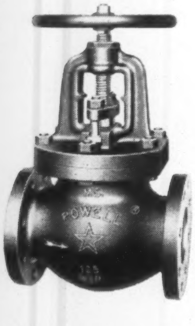


FIG. 241—Iron Body, Bronze Mounted O.S.&Y. Globe Valve for 125 Pounds W.S.P.

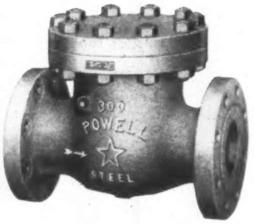


FIG. 3061—Steel Swing Check Valve for 300 Pounds W.S.P.

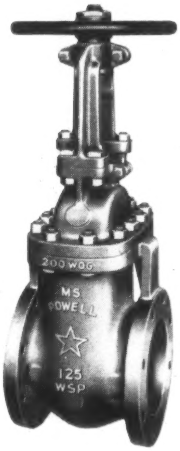


FIG. 1793—Iron Body Bronze Mounted O.S.&Y. Gate Valve for 125 Pounds W.S.P.

for dependable flow control

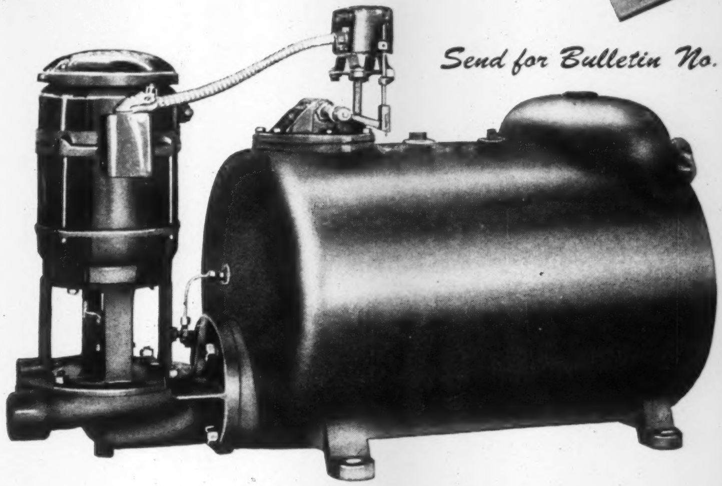
Consult your Powell Valve distributor for full facts about quality proved bronze, iron, steel and corrosion-resistant valves. For every flow control problem—there is a Powell Valve to solve it.

THE WM. POWELL COMPANY, CINCINNATI 22, OHIO . . . 111th YEAR

Skidmore Pumps

Here are the answers to— your Heating Pump Problems

Send for Bulletin No. 10-B



- **Quiet Operation**
- **Low Inlet Connections**
- **Accessibility for Inspection**

TYPE "VC" SINGLE UNIT

Condensation Pump and receiver has low inlet connection . . . operates quietly . . . impeller is bronze centrifugal enclosed type. Especially designed for handling hot condensate, entire unit can be removed for inspection without disturbing piping.

All Skidmore Pumps are furnished in either single or duplex type according to installation requirements.

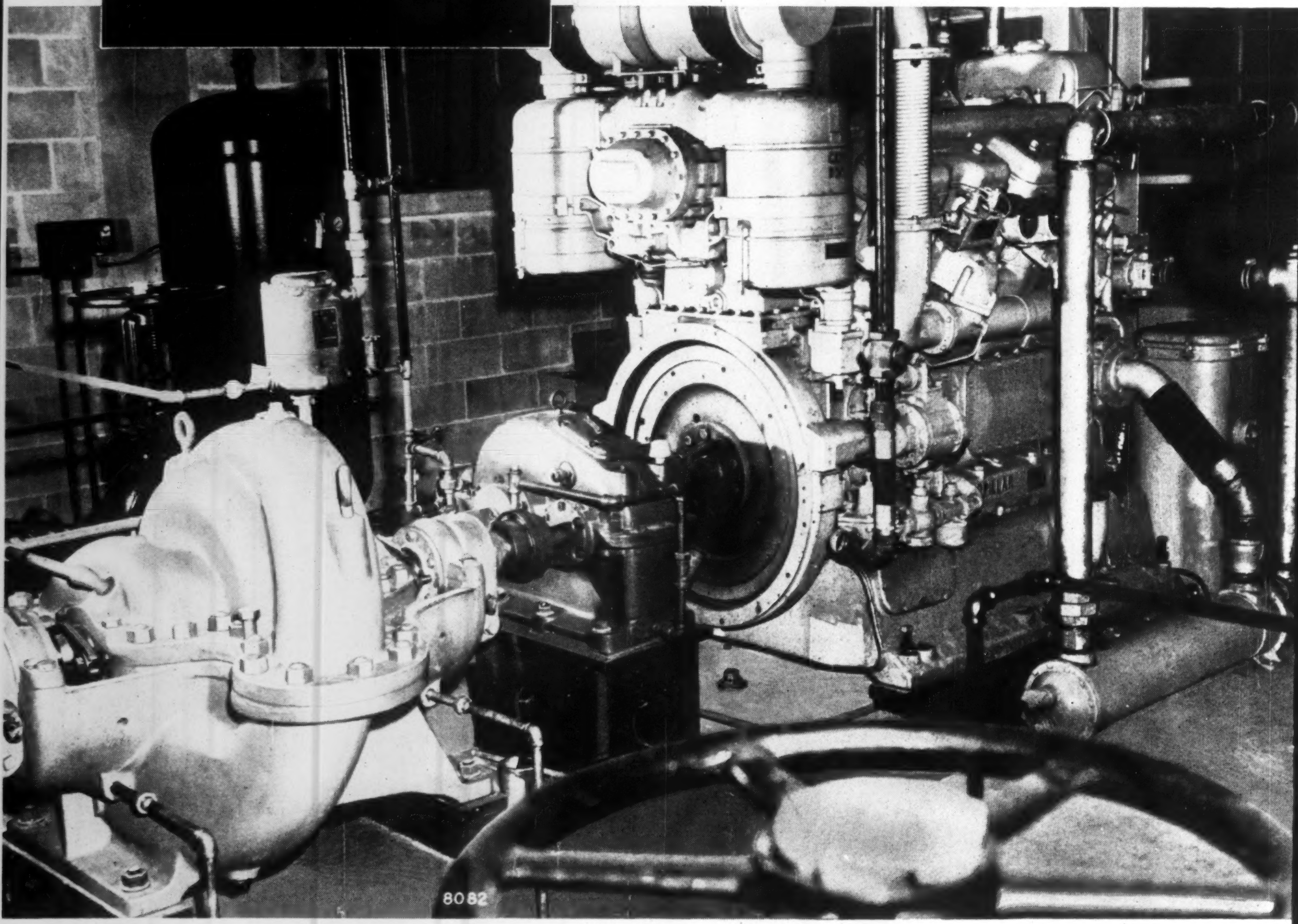
For complete information call or write your nearest Skidmore Pump Representative.

CHOOSE WITH CONFIDENCE

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

DE LAVAL
TWO-STAGE CENTRIFUGAL PUMPS

boost pressure at peak loads in Port Washington, New York



This De Laval two-stage horizontal split-case pump is one of a pair used to boost pressure during peak hours in the Port Washington, New York water works. Taking water from a large underground storage tank, these De Laval units maintain pressure throughout the system. The dependable centrifugal pumps are powered by Caterpillar diesels with speed increasers; they deliver 1500 gpm at 400 feet tdh with 15 feet lift requiring 185 bhp.

De Laval 2IS-2KS pumps are designed with • back-to-back impellers for balanced hydraulic thrust • easily replaceable threaded impeller wearing rings • long-life labyrinth case rings • ring-oiled ball bearings—plus ten other important design features. They are available in sizes from 2 inch to 8 inch discharge, for capacities to 3000 gpm and heads to 750 feet. *Write for Bulletin 1501 giving complete data.*

Consulting Engineer
Angus D. Henderson
Westbury, L. I., N. Y.

Contractor
D. Fortunato, Inc.
Floral Park, L. I., N. Y.

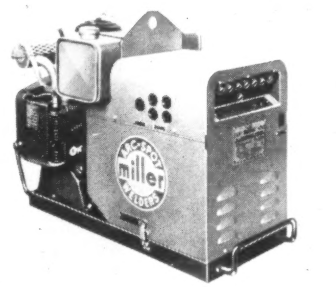
DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY
871 *Nottingham Way, Trenton 2, New Jersey*

DL 387

EQUIPMENT DEVELOPMENTS

Continued from page 224

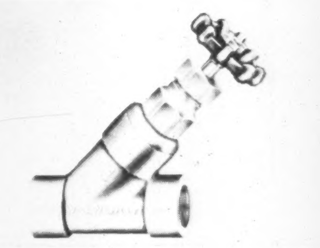


rent or 5 kw of 110/220 a-c power, says company. 1 kw of 110 volt d-c power available while welding. Twin model "AEA-200" does not offer 110/220 power feature.

PVC Fan . . .

. . .engineered to resist corrosion in moving chemically laden air, gases—*Chicago Blower Corp., Dept. HPAC, 9863 Pacific Ave., Franklin Park, Ill.*

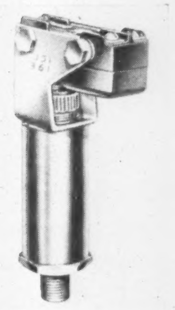
All parts exposed to airstream made of unplasticized polyvinyl chloride. Designed for floor, platform, or roof mounting. Available in several belt driven sizes 12 to 40 in. diameter. Performance ranges 200 to 10,000 cfm at pressures to 6 in. SP and $1/4$ to 10 hp at temperatures to 150 F, depending on fan diameter.



Y-Globe Valve . . .

. . .with all-plastic construction—*Walworth Co., Dept. HPAC, 60 E. 42nd St., New York.*

Made of rigid polyvinyl chloride, unit designed to provide tight shutoff and flow control of alkalies, acids, inorganic salt solutions, other corrosive fluids. For operation at pressures to 150 psi at 75 F. For 1 in. pipe.



Pressure Control . . .

. . .for applications where space, weight are limited—*United Electric Controls Co., Dept. HPAC, 79 School St., Watertown, Mass.*

"J51" available in four models with adjustable ranges of 50, 75, 250 psi between zero and 250 psi limits. On-off differentials between 5 and 10 psi obtainable, depending on model. Pressure settings made by knurled adjustment wheel located inside switch bracket. Units offered with any one of three standard switch types: normally open, normally closed, double-throw with no neutral position.

REED
TRADEMARK

This new Reed Tube Cutter—a faster, lighter-weight roller cutter—is the first cutter for 1" to 3" copper tubing; equally ideal for brass and aluminum tubing from 1" to 3".

New TC3 TUBE CUTTER!

CUTS
1"-3" TUBE
No. TC3
APPROX. 2/3 ACTUAL SIZE
PATENT PENDING

SO light that it weighs just a fraction as much as conventional pipe cutters in the same size range, this new Reed TC3 Tube Cutter does a faster, more convenient cutting job on 1" to 3" tube of copper, brass or aluminum.

THE new Reed TC3, with its single cutting wheel in the movable arm, is far quicker and easier than a hacksaw; the ultra-thin alloy cutting wheel leaves almost no burr; and TC3's lighter pressure avoids distortion of tubing, thereby safeguarding tightness of solder or slip joints. With the single wheel in plain view for lining up with the cut-off mark, the cutter hooks quickly and easily on to tube for a right angle cut.

FRAME of this new Reed TC3 is as light as it is strong and durable because it has been specially-designed of high-grade ductile iron

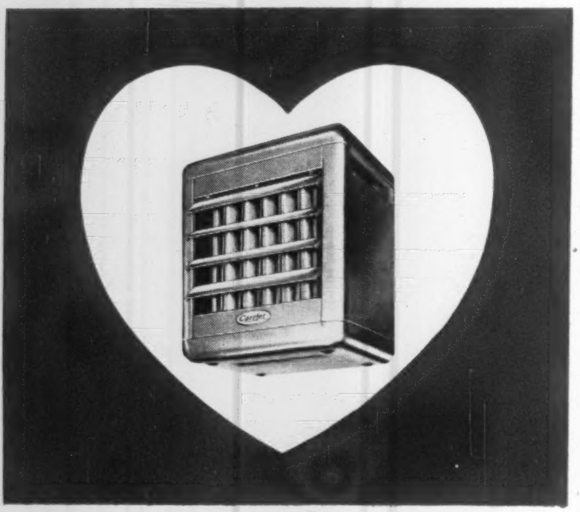
REED MANUFACTURING COMPANY ERIE, PA., REED U.S.A.

Carrier Gas-Fired Heaters offer

TWO BIG ADVANTAGES

straight from the

"heart of aluminized steel"



long-lasting value plus smart design

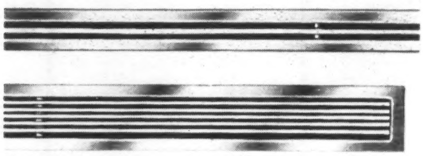
First big advantage: Carrier Gas-Fired Unit Heaters and Duct Furnaces offer special long-lasting value. Only Carrier has this "heart"—an all-welded heat-exchanger made of 16-gauge aluminized steel. It far outlasts ordinary furnace steel of heavier gauge and ceramic coated metals.

Second big advantage: these Carrier Gas-Fired Unit Heaters and Duct Furnaces combine the smart design demanded for the most modern stores and offices . . . with the dependability and performance features that are required by industrial applications.

Along with these two advantages, there is also a wide choice—Unit Heaters in 8 sizes, 50,000 to 230,000 Btu/hr. Duct Furnaces in 7 sizes, 70,000 to 230,000 Btu/hr. Look in the Classified Directory under "Heaters—Unit" for the name of your Carrier wholesaler. Or drop a line to Carrier Corporation, Dept. UH, Syracuse, N. Y.

Carrier

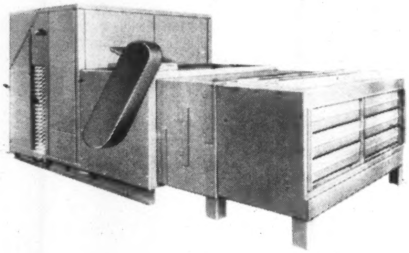
industrial heating • air conditioning • refrigeration



Linear Type Air Diffusers . . .

. . . designed for continuous line use above or below large window areas in banks, schools, hospitals, public buildings—*Titus Mfg. Co., Dept. HPAC, Waterloo, Iowa.*

Extruded aluminum grilles are said to be equally efficient for diffusing air in ceilings, sidewalls or floors. With snap spring clips engineered to make installation quick and simple. Available in 2, 3, 4, 5, 6, 8 in. widths, in lengths of one-piece construction to 12 ft and with front set of louvers fixed at zero or 15 deg deflection.



Multizone Air Conditioning Units . . .

. . . in five sizes 4060 to 19,600 cfm—*Worthington Corp., Dept. HPAC, Harrison, N.J.*

Central station cabinet type units offer as many as 56 coil combinations, are capable of air conditioning to 16 separate zones, says company. Consist of fan section, coil section with heating and cooling coils and/or humidifier, diffuser and damper section, filter box and/or mixing box. Designed to meet any combination of the following heating and cooling requirements: cooling only; heating only; cooling and ventilating; heating and ventilating.

Flux Coated Bronze Rod . . .

. . . for welding bronze and brass, braze welding cast iron and steel—*National Cylinder Gas Co., Dept. HPAC, 840 N. Michigan Ave., Chicago 11.*

By eliminating hand fluxing, new rod will cut welding time by 15 percent, reduce gas consumption, improve quality of welds, says company. "Redifluxed Bronze No. 30" melts at 1625 F, is said to have good tinning qualities and produce high strength welds. In ⅛, 3/16 in. diameters, packed in 10 lb tubes.

A New Approach to Perfection

MAINTENANCE-FREE LIMA MOTORS IN ALL NEW NEMA FRAME SIZES

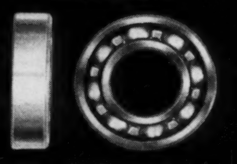
- 30% LESS WEIGHT PER HORSEPOWER
- 30% VOLUMETRIC SIZE REDUCTION
- DUAL FANS INTEGRALLY CAST WITH ROTOR
- COMPLETE ROTOR ASSEMBLIES DYNAMICALLY BALANCED
- RIGID, CAST IRON FRAMES WITH INTEGRALLY CAST FEET
- DIAGONALLY SPLIT CAST ALUMINUM CONNECTION BOXES—CADMIUM PLATED COVER SCREWS
- TOTALLY ENCLOSED FRAMES MEET J.I.C. SPECIFICATIONS

Slash maintenance costs and eliminate costly inspection and lubrication programs with Lima Motors in NEW NEMA frame sizes. With lubricated-for-life DOUBLE-WIDTH ball bearings, solid die cast aluminum rotors with dual integral fans, and Mylar insulation . . . Lima gives you higher full-load speeds with the most complete motor protection available. Install these new Finest Quality Lima Motors—and forget them.

Lima now has in production all ratings in new NEMA frame sizes 182 through 326U. Get complete details on Lima's new NEMA *maintenance-free* motors from your Lima Representative now! If he is not already calling on you, his name and address will be found in *Thomas' Register*, *MacRae's Blue Book* or *Conover-Mast Purchasing Directory*.

Of course, Lima will continue to produce regular NEMA frame sizes 66 to 505 (⅓ to 150 H.P.), incorporating the latest advances in motor design.

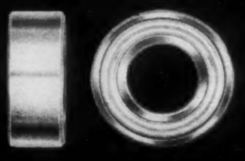
SINGLE-WIDTH UNPROTECTED



THE OLD WAY

Open and unprotected motor bearings subject to contamination and must be inspected and lubricated frequently.

DOUBLE-WIDTH FULLY PROTECTED



THE LIMA WAY

Sealed and protected—Lima's DOUBLE-WIDTH pre-lubricated motor bearings require no attention—just put the motor to work and forget it.

THE LIMA ELECTRIC MOTOR CO., INC., 4991 Findlay Road, Lima, Ohio

Representatives throughout the U. S., Canada and abroad

LIMA

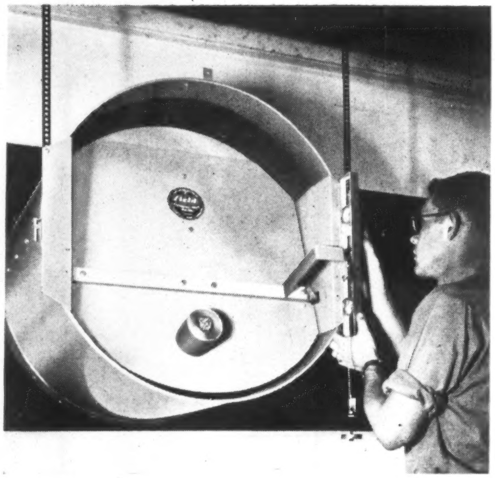
FIRST . . . FOR MOTORS . . . DRIVES . . . SPEED REDUCERS

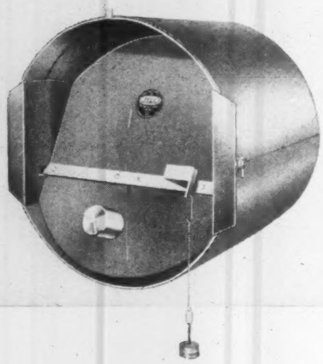
DEPENDABLE, PRECISELY ACCURATE

Draft Control

for coal fired, oil fired, gas fired or gas-oil fired

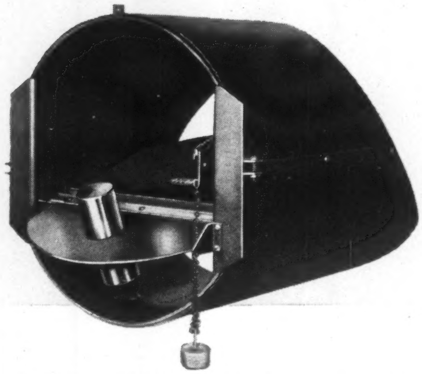
HEATING PLANTS





FIELD TYPE "M" for coal and oil fired heating plants

Heavy duty commercial model in 28″ and 32″ sizes. Heavy, rigid construction assures long, trouble free service. Stainless steel knife edge bearing for permanent sensitivity. Also available in 6″ through 24″ sizes for domestic and commercial installations. First choice of heating men — the round control you can level on any flue.



FIELD TYPE "MG" for gas and gas-oil fired heating plants

A heavy duty, precision built control in sizes 8″ through 32″ for commercial and industrial installations. Stainless steel knife edge bearings for permanent sensitivity. Gate opens inward to regulate updrafts, and outward to relieve down-drafts. Optional safety switch available where codes require. Fully proven, accepted virtually everywhere.

They're real HEAVYWEIGHTS

Compare the weight of a Field Control to any other available. Here is proof of the massive, welded construction, long, vibration-free service, that permits Field's supreme accuracy.

Size Control	Thickness of Parts Gate	 Side Plates	 Ring	 Collar	Wt. without Crtn. or Crate
14 M	16 Ga.	16 Ga.	3/16 x 2″	22 Ga. Galv.	19 #
16 M&MG	16 Ga.	16 Ga.	3/16 x 2″	18 Ga. Galv.	28 #
18 M	16 Ga.	16 Ga.	3/16 x 2″	18 Ga. Galv.	35 #
20 M&MG	16 Ga.	16 Ga.	1/4 x 2″	18 Ga. Galv.	41 #
24 M&MG	14 Ga.	16 Ga.	1/4 x 2″	18 Ga. Galv.	65 #
28 M&MG	14 Ga.	14 Ga.	1/4 x 4″	14 Ga. H.R.S.	110 #
32 M&MG	14 Ga.	14 Ga.	1/4 x 4″	14 Ga. H.R.S.	140 #

field

FIELD CONTROL DIVISION

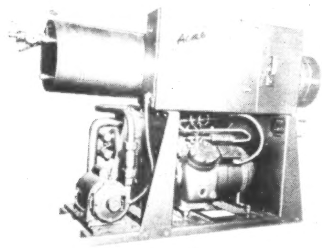
of H. D. CONKEY & COMPANY, Mendota, Ill.

Affiliates

Conco Building Products, Inc. • Brick, Tile, Stone
Conco Materials Handling Division • Cranes, Hoists

EQUIPMENT DEVELOPMENTS

Continued



Packaged Chillers . . .

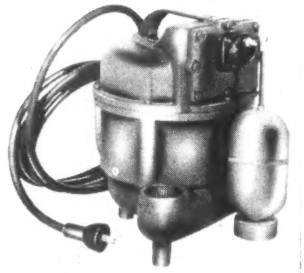
. . . in six new models—*Acme Industries, Inc., Dept. HPAC, Jackson, Mich.*

Cited feature of new "Flow-Cold" units is improved arrangement of controls and their enclosure in protective steel cabinet to keep unauthorized personnel from tampering. Capacities range 3 to 20 tons.

Hermetic Service Kit . . .

. . . designed to service all types of hermetic units with one valve—*Kerotest Mfg. Co., Dept. HPAC, 2525 Liberty Ave., Pittsburgh 22.*

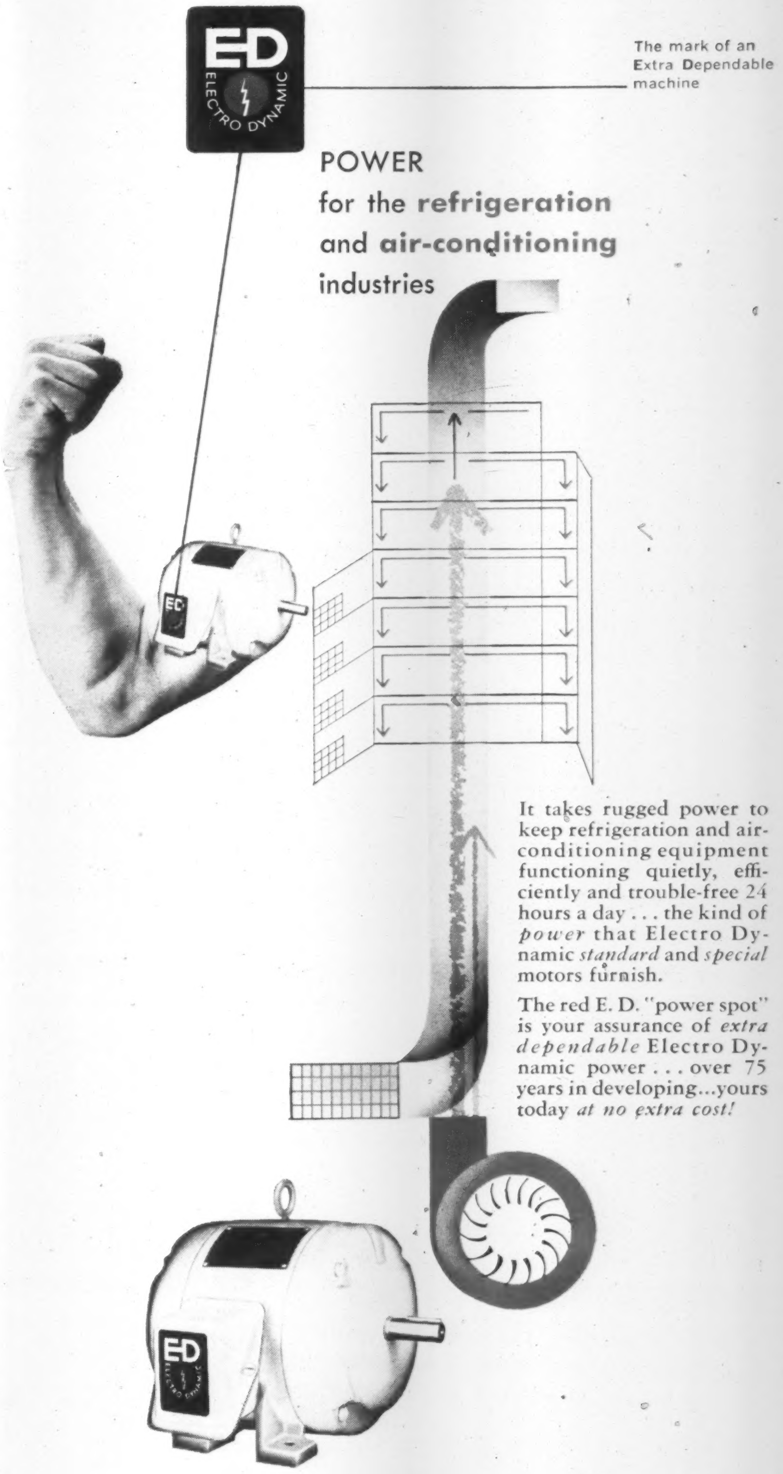
Master valve furnished with adaptors, stem extensions to service specific units. Valve equipped with stainless steel stem to provide longer service life, says company.



Sump Pumps . . .

. . . with "quick-change" switch feature—*Piqua Machine & Mfg. Co., Dept. HPAC, Piqua, Ohio.*

Is said to permit fast, easy service of "Enpo" units on the job. Designed to eliminate dismantling entire pump if trouble arises during operation. Operator needs only to remove eight bolts, pull out old switch and insert new one, says company.



The mark of an
Extra Dependable
machine

POWER
for the **refrigeration**
and **air-conditioning**
industries

It takes rugged power to keep refrigeration and air-conditioning equipment functioning quietly, efficiently and trouble-free 24 hours a day . . . the kind of *power* that Electro Dynamic *standard* and *special* motors furnish.

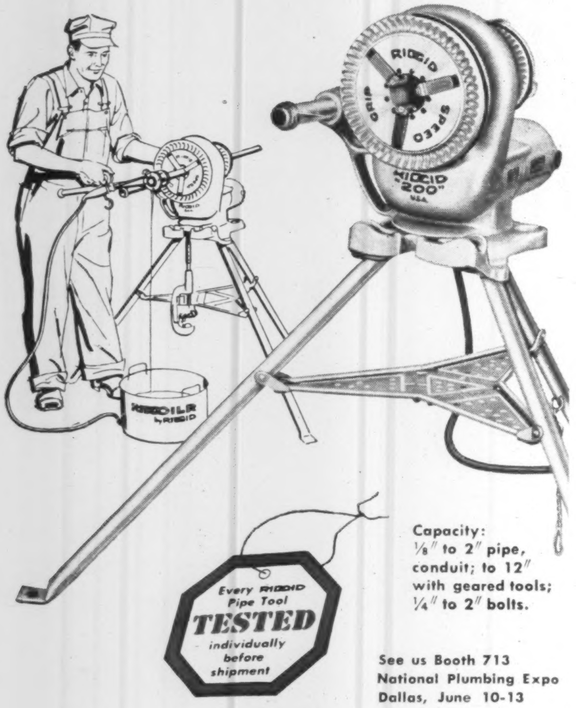
The red E. D. "power spot" is your assurance of *extra dependable* Electro Dynamic power . . . over 75 years in developing...yours today *at no extra cost!*

ELECTRO DYNAMIC
DIVISION OF GENERAL DYNAMICS
CORPORATION
BAYONNE, NEW JERSEY

Work-Saving

POWER

for your pipe tools . . . anywhere!



Capacity:
⅛″ to 2″ pipe,
conduit; to 12″
with geared tools;
¼″ to 2″ bolts.

See us Booth 713
National Plumbing Expo
Dallas, June 10-13

Portable

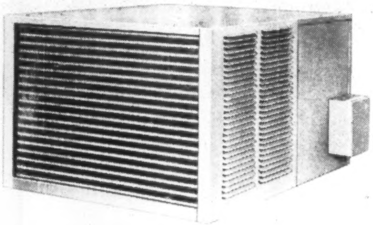
RIDGID

200 Power Drive
with folding legs and tray

Cut, thread and ream easily when this very portable 200 turns pipe for your tools. Integral legs and handy built-in folding tray make it extra easy to carry and set up. Speed Chuck operates easily by hand, grips tight forward, reverse. Light, compact, rigid working stance—see all its advantages at your Supply House.

The Ridge Tool Company, Elyria, Ohio, U. S. A.

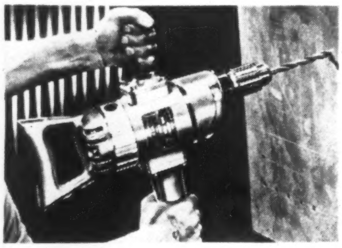
RIDGID
Work-Saver Pipe Tools



Waterless Cooling Package . . .

. . . for small commercial use—*Century Engineering Corp., Dept. HPAC, Cedar Rapids, Iowa.*

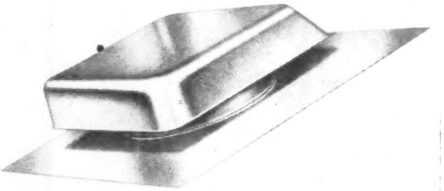
"Coolpak" two-stage, air cooled unit available in 2, 3½ hp sizes. Cited features: twin compressors for operating economy; air cooled condenser; squirrel cage blower and evaporator, utilizing evaporator condensate to provide cooling capacity.



Portable Electric Drills . . .

. . . in three new models—*Black & Decker Mfg. Co., Dept. HPAC, 628 Pennsylvania Ave., Towson 4, Md.*

Units are company's ½ in. "Heavy-Duty," ⅝ in. "Heavy-Duty," ¾ in. "Standard" drills. Cited features: up to 130 percent more power; three-position, built-in reversing mechanism drives with equal power in both directions; positive key-drive chuck that eliminates slippage.

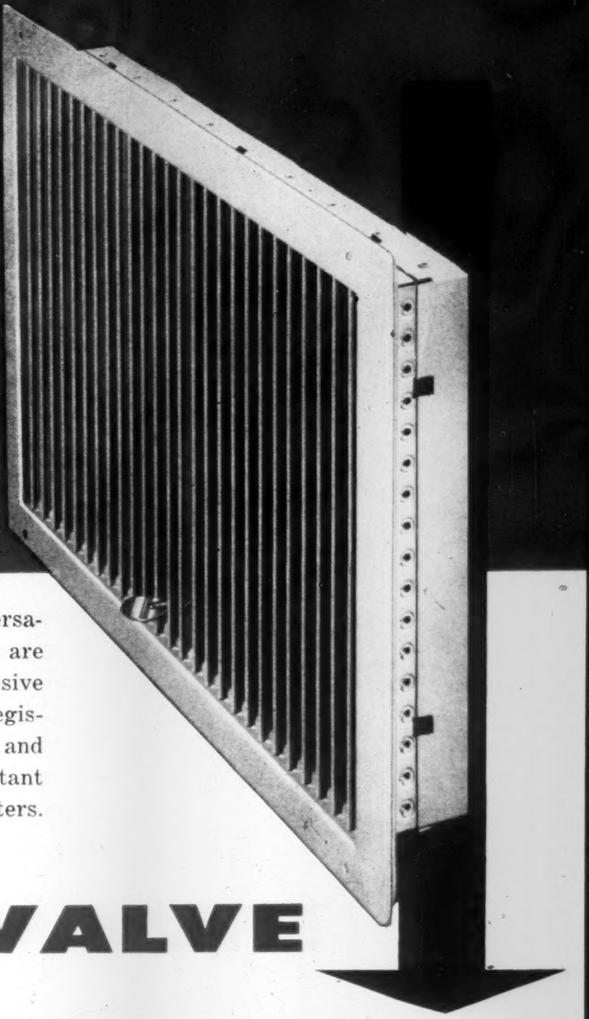


Roof Ventilator . . .

. . . with low silhouette design—*Leslie Welding Co., Inc., Dept. HPAC, 2943 W. Carroll Ave., Chicago.*

"Series 50" engineered for ease of installation. Incorporates baffle under rear of hood and weather flange around top of stack to keep out rain, snow. 4 in. flange is said to make for quick, weathertight installation. Provides 41 sq in. free area.

MULTI-TROL
COMMERCIAL REGISTERS
by Air Control
GIVE YOU THIS BIG DIFFERENCE*

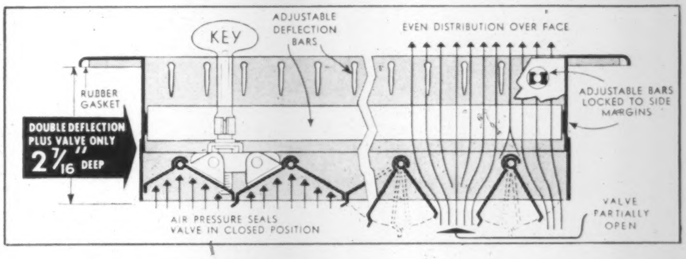


With Multi-Trol commercial registers you get performance and versatility no others can equal. Where ordinary commercial registers are too deep to be used with standard ducts, Air Control's exclusive Shallo-Valve solves the problem. Multi-Trol 4-way deflectional registers with Shallo-Valve can be installed in standard 3¼″ ducts, and still leave ample space for adequate air flow. That's the important difference between Multi-Trol and any other commercial registers.

New* SHALLO-VALVE

EXCLUSIVE WITH MULTI-TROL COMMERCIAL REGISTERS

Multi-Trol Shallo-Valve louvers are the opposed-action type, designed to deliver air evenly over the face of the register at any velocity. When closed, air pressure seals the valve tightly, preventing annoying whistles. Adjustable bars and opposed-action valves provide positive 4-way control of the air stream. The Shallo-Valve of Multi-Trol registers, only 2½″ deep, requires no special duct work in commercial or residential heating-cooling installations.


KEY
ADJUSTABLE DEFLECTION BARS
EVEN DISTRIBUTION OVER FACE
RUBBER GASKET
ADJUSTABLE BARS LOCKED TO SIDE MARGINS
DOUBLE DEFLECTION PLUS VALVE ONLY 2 7/16″ DEEP
AIR PRESSURE SEALS VALVE IN CLOSED POSITION
VALVE PARTIALLY OPEN

Only Multi-Trol commercial registers by Air Control offer you all these advantages:

Key-operated Shallo-Valve — Minimum Air Resistance — Air Foil Contour Face Bars — Modern Styling with smooth, rounded corners — Handsome beige finish. Pivots of adjustable face bars are locked into margin, can't pull out.

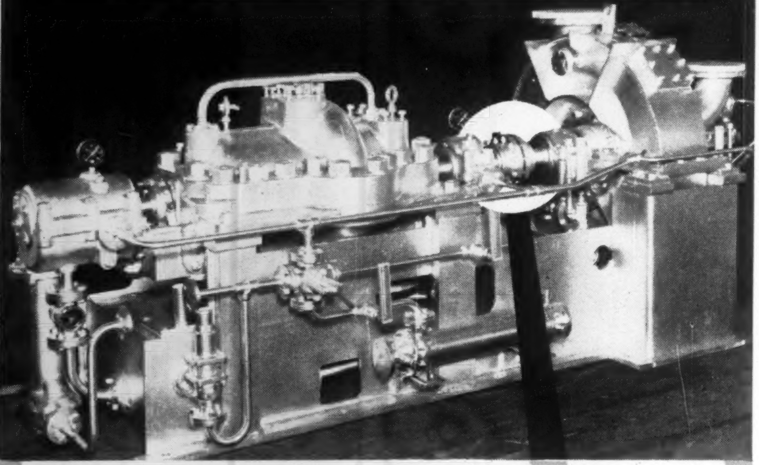
Multi-Trol registers and grilles come in a wide range of sizes and styles for every need. See your favorite jobber.

WRITE FOR CATALOG 56-AC SHOWING THE COMPLETE MULTI-TROL* LINE

*Patent Pending

AIR CONTROL PRODUCTS, INC., 357 Center St. — Coopersville, Mich.

Why settle for less?



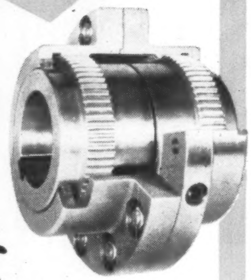
Waldron coupling on turbine driven feedwater pump.

by specifying

WALDRON

Gear Couplings

you get



STRENGTH —Hubs and cover sleeves for sizes 1¼A through 7A are machined from tough steel forgings. Hubs are keyed to the shafts. The two one-piece cover sleeves function as a single, rigid unit serving as a floating connecting link between the hubs. High strength of forgings makes possible a very compact coupling with low rotating inertia.

RELIABILITY —There are no flexible parts to bend or break and the coupling is dust, moisture, and oil tight. Patented Walflex seal is positioned where centrifugal force is least. Clearance between teeth in hubs and sleeve is engineered so that an oil wedge always separates them, taking the wear.

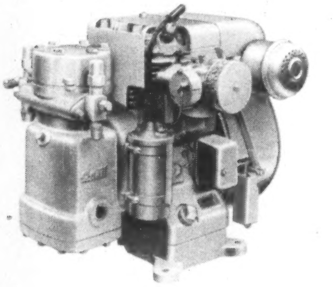
SERVICE —Plenty of rough bore couplings, already assembled—on the shelf for *immediate* delivery. Finish bored standard couplings shipped to meet customers' schedules. We are geared up to give you realistic delivery on *any* type of couplings.

▶ Ask for Catalog 57

JOHN **WALDRON** CORP.
NEW BRUNSWICK, NEW JERSEY
Representatives In Principal Cities

EQUIPMENT DEVELOPMENTS

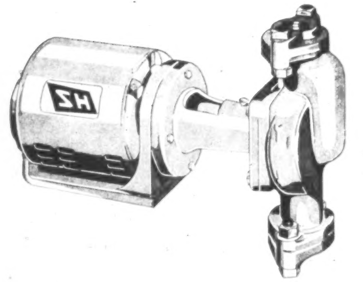
Continued



Engine-Compressors . . .

. . . for air conditioning, refrigeration applications—*D. W. Onan & Sons, Inc., Dept. HPAC, Minneapolis* 14.

Available in three sizes with capacities 1 to 5 tons. Recommended by company for cooling of any enclosure where self powered air conditioning or refrigeration system is required. Units consist of "high speed" refrigeration compressors directly connected to short stroke, air cooled engines.



Hot Water Circulator . . .

. . . added to company's line—*Sid Harvey, Inc., Dept. HPAC, Valley Stream, N.Y.*

In 1½ in. size with interchangeable flanges to allow it to be used on ¾, 1, 1¼, 1½ in. applications. ⅛ hp motor mounted in horizontal position. Circulator may be mounted on vertical or horizontal pipe by changing four bolts.

Flexible Plastic Pipe . . .

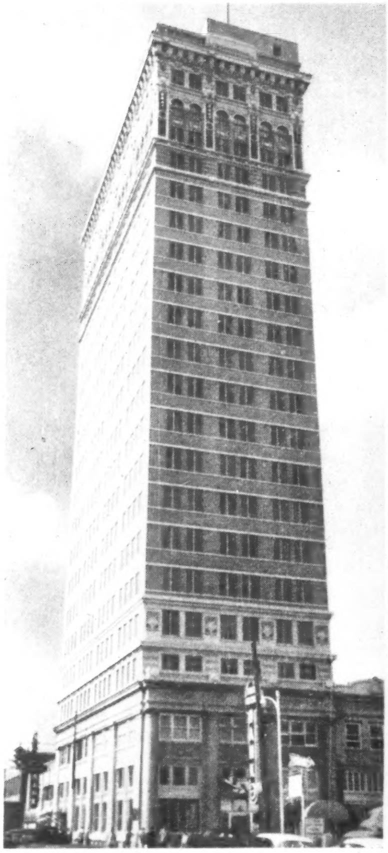
. . . in ½, ¾, 1, 1¼, 1½, 2 in. inside diameters *Consolidated Pipe Co. of America, Dept. HPAC,* 1066 *Home Ave., Akron* 10.

Formulated to resist acids, alkalies,

40 Tons

OF REFRIGERATION SAVED!

ShadeScreen's slanted louvers deflect solar heat away from Waco's Amicable Building to reduce the required air conditioning capacity by 12%.



"You just can't air condition it!" said many experts of the 44-year-old Amicable Building in Waco, Texas.

But today all 75,000 square feet of floor space are successfully cooled by just 287 tons of refrigeration — with a valuable assist from Kaiser Aluminum ShadeScreen. According to L. E. Overton, building manager, at least 40 more tons would have been needed if ShadeScreen had not been specified for the windows at the time when air conditioning was installed. In addition, ShadeScreen has eliminated harsh interior glare. Its clean architectural lines have added a distinctive modern touch to the facade. And its rust-proof permanency has assured virtually no upkeep.

Today, more and more customers are finding ShadeScreen the economical and practical answer to air-conditioning problems. Send coupon now for AIA catalog and complete information.

This light beam shows how ShadeScreen stops blistering sun rays *before* they reach the window. The secret: tiny slanted louvers *block* the sun's rays, thus reduce build-up of interior heat. Result: air conditioning efficiency is increased — money is saved in installation and operating costs.

TYPICAL EXAMPLE OF SHADESCREEN ECONOMIES

4:00 P.M. **Peak Load 23 West Windows, 3½′ x 6′**	**Instantaneous Heat Gain BTU/Hr.**	**Refrigeration Saving in tons**
Unshaded windows	111,000	
SHADESCREENED windows	34,800	
Heat Blocked by SHADESCREEN	76,200	6.35
10:00 A.M. **Peak Load 24 East Windows, 3½′ x 6′**		
Unshaded windows	69,500	
SHADESCREENED windows	17,650	
Heat Blocked by SHADESCREEN	51,850	4.31
12:00 Noon **Peak Load 11 South Windows, 3½′ x 6′**		
Unshaded windows	26,800	
SHADESCREENED windows	8,550	
Heat Blocked by SHADESCREEN	18,250	1.52
TOTAL TONS REFRIGERATION SAVED, 1 ton/12,000 BTU/Hr.		12.18

SHADESCREEN *

by Kaiser Aluminum

*** Trademark—a louvered screening product made by Kaiser Aluminum**

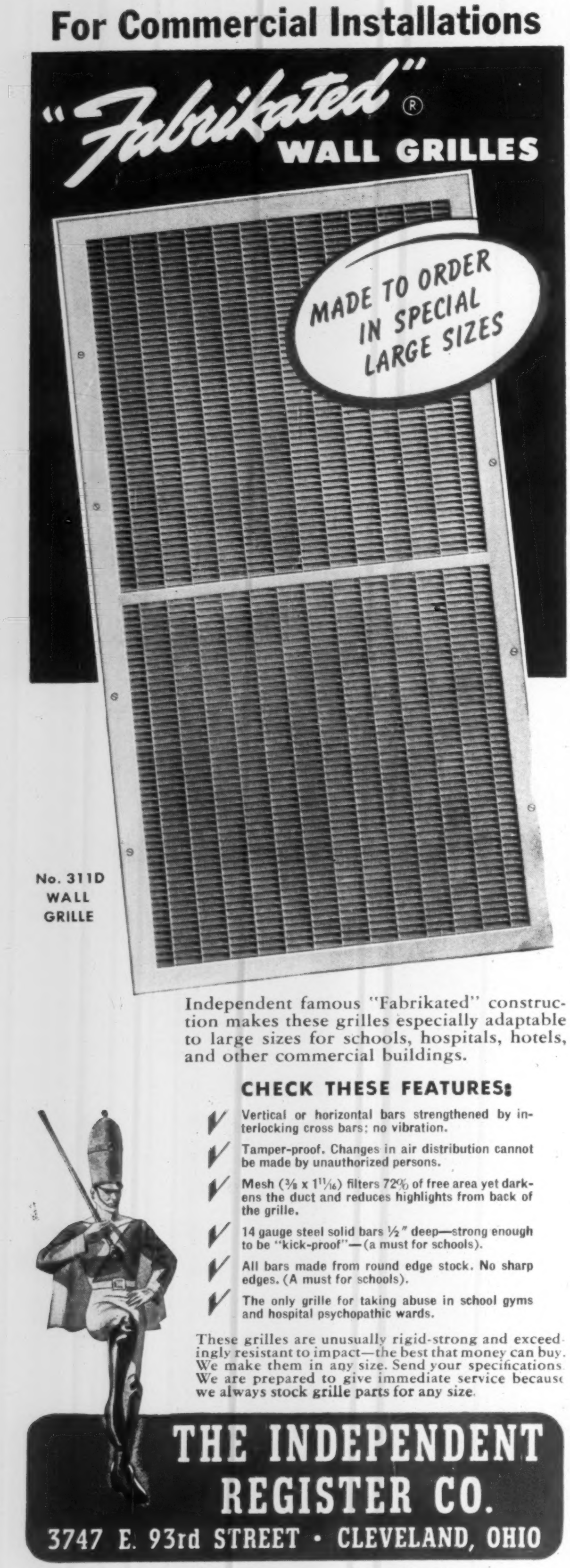
KAISER ALUMINUM & CHEMICAL SALES, INC., ROOM 84111,
CHICAGO ADVERTISING DEPT., 919 N. MICHIGAN AVE., CHICAGO 11, ILL.

Please send me complete information about Kaiser Aluminum ShadeScreen, including your AIA File Catalog. In addition, please send me the name of my nearest ShadeScreen supplier.

NAME ____________________

ADDRESS ____________________

CITY ____________________ STATE __________


For Commercial Installations

"Fabrikated"® WALL GRILLES

MADE TO ORDER IN SPECIAL LARGE SIZES

No. 311D WALL GRILLE

Independent famous "Fabrikated" construction makes these grilles especially adaptable to large sizes for schools, hospitals, hotels, and other commercial buildings.

CHECK THESE FEATURES:

✓ Vertical or horizontal bars strengthened by interlocking cross bars; no vibration.

✓ Tamper-proof. Changes in air distribution cannot be made by unauthorized persons.

✓ Mesh ($\frac{3}{8}$ x $1\frac{11}{16}$) filters 72% of free area yet darkens the duct and reduces highlights from back of the grille.

✓ 14 gauge steel solid bars ½" deep—strong enough to be "kick-proof"—(a must for schools).

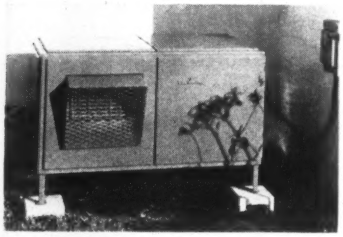
✓ All bars made from round edge stock. No sharp edges. (A must for schools).

✓ The only grille for taking abuse in school gyms and hospital psychopathic wards.

These grilles are unusually rigid-strong and exceedingly resistant to impact—the best that money can buy. We make them in any size. Send your specifications. We are prepared to give immediate service because we always stock grille parts for any size.

THE INDEPENDENT REGISTER CO.
3747 E. 93rd STREET · CLEVELAND, OHIO

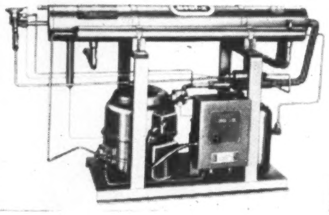
metallic salts, most chemicals. Available in industrial grades, regular grade. Made of virgin, nontoxic materials. Guaranteed against rot, rust, electrolytic corrosion, says company.



Air-to-Air Packaged Heat Pumps . . .

. . . in range of sizes 3 to 30 tons—*WeatherKing of Florida, Inc., Dept. HPAC,* 2310 *Coolidge Ave., Orlando, Fla.*

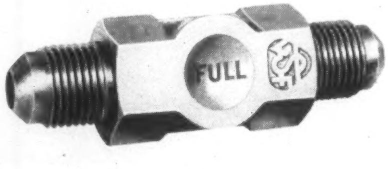
Constructed in two units with compressor section for outdoor installation. Indoor air handling section requires only very small space, says company. Available with "heat booster" which employs small amount of any source of water to supply supplementary heat during periods of low outdoor temperature.



Packaged Chillers . . .

. . . for light commercial chilled water air conditioning systems—*Heat-X, Inc., Dept. HPAC, Brewster, N.Y.*

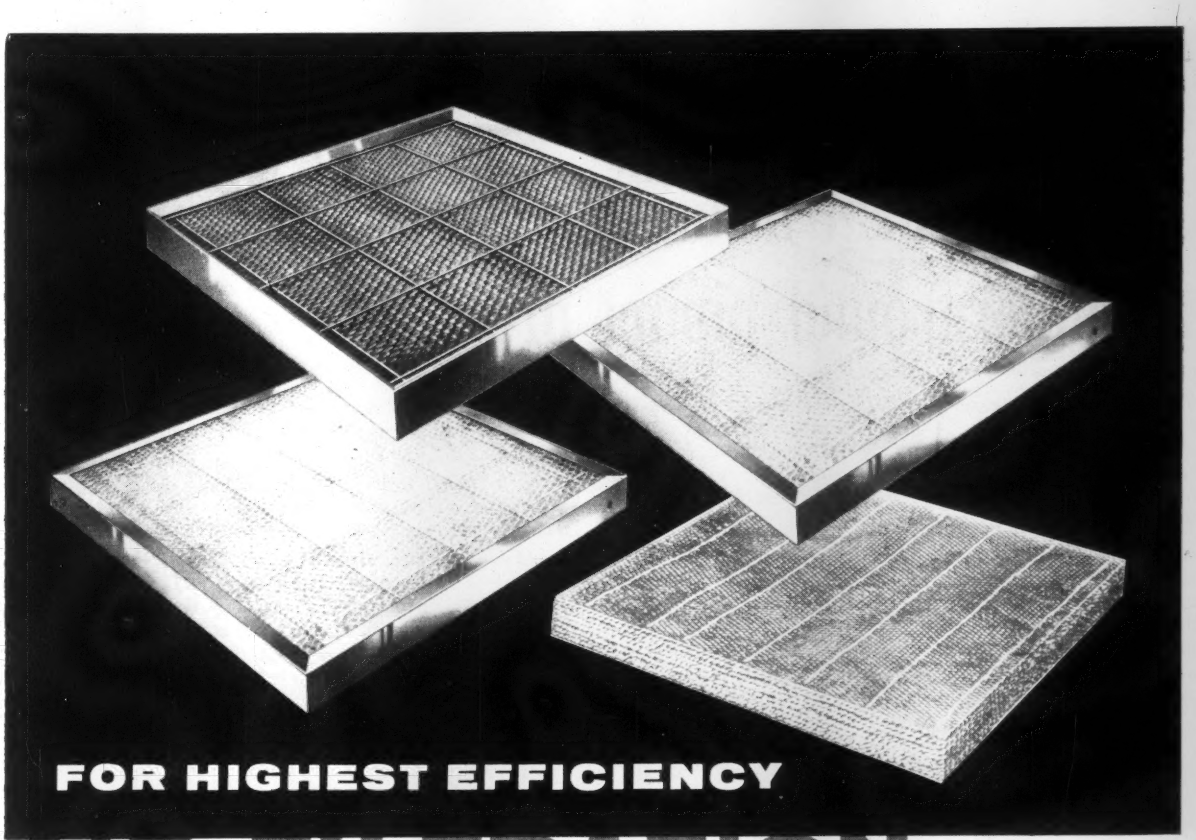
Designed for maximum space saving, high efficiency. Units feature company's "Inner-Fin" construction, said to provide greater cooling capacity with minimum of bulk. Available in 2, 3, 5 hp models.



Double-Port Sight Glass . . .

. . . for air conditioning, refrigeration applications—*Superior Valve & Fittings Co., Dept. HPAC,* 1509 *W. Liberty Ave., Pittsburgh* 26.

"Hermetic Eye" designed to check on condition of



AIR FILTRATION

RP AIR FILTERS
FOR RESIDENTIAL, COMMERCIAL, INDUSTRIAL APPLICATIONS

EZ KLEEN

The aluminum, washable air filter that features easy cleaning and moderate cost. Standard E Z Kleen in ½", 1" and 2" thicknesses—350 F.P.M. rating. Multi-Velocity E Z Kleen in 1" and 2" thicknesses—520 F.P.M. rating. Easily washed and re-coated with Filter-Coat (dust and dirt removing adhesive) or Super Filter-Coat (dust and odor removing adhesive) for like-new efficiency.

GREASE FILTER

Aluminum grease filters for kitchen exhaust systems. End grease nuisance and resulting costly maintenance to motor and blower equipment...reduce fire hazard ...increase sanitation. Attractive aluminum improves kitchen appearance. Strong, lightweight, easy-to-handle.

INDUSTRIAL FILTER

Economical, lightweight, easy-to-clean, aluminum filters for both high or low velocities. Reduce operating costs through longer service life and top performance. Ideal for new or existing installations.

PAINT ARRESTORS

Inexpensive, disposable filter pads that remove paint overspray solids from exhausted air in paint spray booths. Simple installation, using holding frames, in banks of any size. R P Paint Arrestors are efficient in operation...versatile...economical in operating and initial costs...save floor-space...reduce down-time.

WRITE FOR COMPLETE INFORMATION

RP ... PRODUCTS OF RESEARCH

RESEARCH PRODUCTS *Corporation*
Dept. 46, Madison 10, Wisconsin

GILSULATE®

Specially sized, selected and blended Gilsonites

...the natural insulation that is the answer to underground piping problems

To Torture Any Thermal Insulation—Bury It! The severest service test of any thermal insulation is burial underground. High humidity, heavy structural loading, a chemically and organically active environment, thermal cycling and pipe movement, and vibration—all these work to break down the insulation.

Why Buried Piping Corrodes: External corrosion of buried piping is variously caused: *Electrolytic attack* occurs when stray direct currents find their way from a piping system to the earth, at which point pitting occurs on the pipe surface. *Galvanic attack* results from current generated when metal touches certain types of soils. *Chemical attack* may include damage by water in liquid or vapor form, earth salts, chemicals from industrial or organic wastes, or by chemicals in various insulating materials.

Gilsulate solves an old problem by surrounding the piping with a material which is a dielectric, is chemically neutral and stable, is a *natural* insulator and which, in the case of buried hot piping, also forms a good vapor barrier.

No other insulation protects buried hot piping completely! Gilsulate is the only insulation which can provide the three *vital* means of protection, and also withstand the destructive forces of burial in the earth. It is physically and chemically stable. It will not dissolve, crush or rot. It is not rigid; therefore, ground and pipe movement will not destroy its effectiveness.

8 Reasons to use and specify GILSULATE

1. IT IS A NATURAL INSULATION

Gilsulate is mined, crushed, screened and blended from pure Gilsonite mineral, a unique hydrocarbon found only in eastern Utah. No chemical or other physical change is made in the natural mineral. It is a *natural* insulation. Gilsonite is mined in an exceptionally pure state with virtually no trace minerals or foreign materials. Gilsulate is specially sized, selected and blended Gilsonites.

2. IT PROTECTS PERMANENTLY

The Gilsulate system solves the problem of insulating underground hot piping permanently—and at low cost.

3. IT CANNOT DETERIORATE

Chemically inert and stable, Gilsulate cannot change with time, moisture or soil. It is impervious to mold, fungus, bacteria, rodents, plant growth and soil chemicals. It has lain unchanged in the earth for millions of years.

4. IT IS PACKAGED FOR EASY HANDLING

Gilsulate is supplied in 2½ cu. ft. sacks. Shipping, storage and handling at the job site are easy. No bulky, heavy units requiring cranes or special tackle—practical packaging for palletized loading or manhandling to hard-to-reach piping locations.

5. ...AND IT IS ADAPTABLE AT JOB SITE

Gilsulate needs no pre-cutting, mixing, assembling or fitting. Last minute job site changes in the piping layout or arrangements will not demand special fittings or changes in the insulating equipment or methods.

6. EASILY INSTALLED

Gilsulate all but installs itself. Just pour it on... tamp it down... heat the piping... backfill. The Gilsulate fuses to form a plastic protective sheath around the pipe.

7. NO SPECIAL FORMING OR MATERIALS NEEDED

Gilsulate adjusts itself to pipe expansion; provides its own vapor barrier. No hand fitting is needed; no special vapor barriers need be installed. Usually, the trench walls and floor are the only forms needed. Sheet metal or wood slip forms may be used if trench is cut wider than the insulating envelope desired. For a single pipe, or complex multiple piping system, *installation is simple.*

8. PIPING ALWAYS EASILY ACCESSIBLE

Gilsulate structure gives the only underground piping system which can be opened and re-installed with only pick and shovel. Alterations and additions to Gilsulate-insulated systems demand no more skill than does altering a fully exposed piping system.

Do you receive Pipe Insulation News?
Ask to be put on our mailing list.

American Gilsonite Company

134-B West Broadway, Salt Lake City 1, Utah
3537 Lee Road, Cleveland 20, Ohio
Affiliate of Barber Oil Corp. and Standard Oil Co. of California

GILSULATE DISTRIBUTORS

**Ask for a demonstration
of GILSULATE's unique properties**

ALABAMA
Palmer & Lawrence,
3110 Clairmont Ave. So., P.O. Box 1572, Birmingham
ARIZONA
Carns-Hoaglund Company, 420 N. 15th Avenue, Phoenix
CALIFORNIA
Industrial Insulators, 1356 So. Flower, Los Angeles 15
1372 Ocean Avenue, Emeryville
COLORADO
Joy and Cox, Inc., 2124 Broadway, Denver 2
FLORIDA
George A. Israel, Jr., 115 Park Street, Jacksonville
581 S.W. 47th Ave., Miami 34
GEORGIA
John A. Dodd Co., 299 Techwood Drive, N.W., Atlanta
ILLINOIS
Eagle Industrial Co., Inc., 1021 N. 18th St., E. St. Louis
Roy O. Nelson Company, 330 S. Wells St., Chicago 6
INDIANA
Jackson Engineering Co., Inc.,
1531 N. Pennsylvania St., Indianapolis 2
721 W. Prospect St., Terre Haute
IOWA
Allied Industries, Inc., 736 Federal Street, Davenport
KENTUCKY
Jackson Engineering Co., Inc.,
660 S. 5th St., Louisville 2
LOUISIANA
Edgar Murray Supply Co., Inc.,
232 Canal St., New Orleans 6
MARYLAND
Freemire & Associates, Inc.,
2802 Ridgewood Ave., Baltimore 15
MASSACHUSETTS
Beaulieu and Munroe, 82 Crescent Avenue, Boston 25
MICHIGAN
John F. Wolff Company, 726 Lothrop, Detroit 2
MINNESOTA
Paul W. Abbott Co., Inc., 704 Vandalia St., St. Paul 14
MISSOURI
Anderson-Stolz Corp., 1727-33 Walnut St., Kansas City 8
NORTH CAROLINA
Dillon Supply Company, 216 South West St., Raleigh
NORTH DAKOTA
Lignite Combustion Engineering Corp.,
215 Airport Rd., Bismarck
NEW JERSEY
A. F. Hinrichsen, Inc., 9 Ampere Parkway, East Orange
NEW YORK
H. V. Boggs Co., Inc., 419 E. Jefferson St., Syracuse 2
A. F. Hinrichsen, Inc., 50 Church Street, New York 7
Smith & Wolfe, P.O. Box 128, Rensselaer
OHIO
William G. Jewett Co., 12417 Cedar Rd., Cleveland 6
The Henry P. Thompson Co.,
1717 Section Rd., Cincinnati 37
OKLAHOMA
Loeffler-Greene Supply Company,
1604 N. W. 5th, Oklahoma City
OREGON
Mead and Associates,
317 S. W. Alder St., Rm 1100, Portland 4
PENNSYLVANIA
Holly Specialties Co., Inc., Walnut Park Plaza Hotel,
Walnut at 63rd Street, Philadelphia 39
J. F. Scouler Company, 221 North 2nd St., Harrisburg
Tutein Equipment Co., P. O. Box 4453, Pittsburgh 5
SOUTH CAROLINA
Applied Engineering Co., P. O. Box 506, Orangeburg
TENNESSEE
John M. Dooley & Assoc., 1832 McCalla Ave., Knoxville
Hurston-Conaway, Inc., 2470 Poplar Avenue, Memphis
TEXAS
J. R. Dowdell & Company, 4024 Swiss Avenue, Dallas
UTAH
Williams, Gritton & Wilde, 204 Dooly Bldg., Salt Lake City
VIRGINIA
Shultz and James, Inc., 7 North 6th Street, Richmond
WASHINGTON
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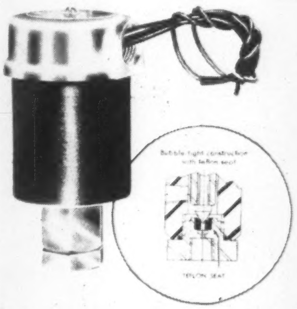
CANADA
Banton Engineering Specialties,
360 Richmond Road, Ottawa, Ontario
Canwest Industrial Products,
1019–10th Ave. W., Calgary, Alberta
Engineering Equipment Co., Ltd.,
874 Beaumont Ave., Montreal, Que.
Insul-Mastic Corporation, Ltd.,
1400 Spruce St., Winnipeg, Manitoba
Perry Products Ltd.,
528 West 6th Avenue, Vancouver 9, B. C.
Michael Stuart Company, Ltd.,
102 Eglinton Ave. E., Toronto, Ontario

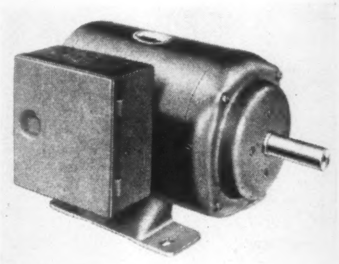
refrigerant liquid. Construction eliminates gaskets, moving parts, extraneous fittings. Made from one-piece forging. Into two ports is fused heat resistant, high tensile strength glass, says company.



Solenoid Valve . . .

. . .designed to remain bubble-tight at pressures to 5000 psi—*Atkomatic Valve Co., Inc., Dept. HPAC, 545 W. Abbott St., Indianapolis 25.*

"Type SBTDW" is small, direct lift, angle type, machined from stainless steel bar stock. Construction is said to provide very good corrosion resistance. Recommended by company for applications where high pressure is combined with relatively little flow. Pipe sizes are 1/8 and 1/4 in. with 1/16, 3/32, 1/8, or 3/16 in. port sizes.



Motors . . .

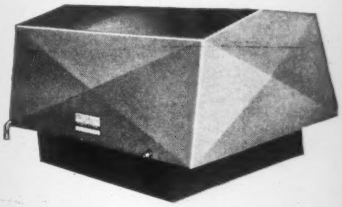
. . .designed to have high starting torque, low starting and running current characteristics—*Brown-Brockmeyer Co., Dept. HPAC, Dayton 1, Ohio.*

Repulsion start-capacitor run single-phase units available in 1,

AirMpeler

LO-BOY
CENTRIFUGAL
ROOF EXHAUSTERS

Enhance The Beauty Of Building Skylines



Pats.
Pend.

Lowest Silhouette Design

Forward or Backward Curve Wheel Within . . . . or Out of Scroll Housing

Motor mounting on side of structure support . . . out of line of air stream reduces height of Lo-Boy models nearly 50% of older designs.

LOW WIND RESISTANCE
SIZES 10"-72" 600-47,000
CERTIFIED C.F.M. RATINGS

- **QUALITY**
- **BEAUTY**
- **PROVEN PERFORMANCE**

See Sweet's File 20c/Amm or Write for bulletin HA-100 57

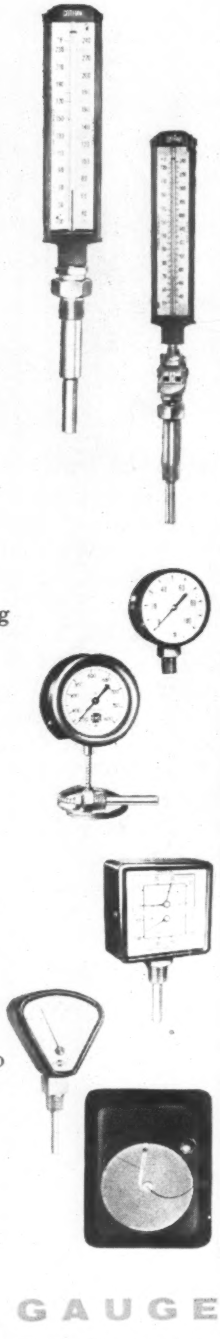
AMMERMAN CO., INC.

110 North Second St.
Minneapolis 1, Minnesota

USG

. . . trademark of
DEPENDABILITY

for every heating and air conditioning application



To contractors, heating and air conditioning engineers, and equipment manufacturers, the USG trade mark is synonymous with ACCURACY, RUGGEDNESS, DEPENDABILITY.

Contractors will tell you that gauge for gauge—in every application classification—in every price range—you get more value with USG. These qualities, among others, influence more original equipment manufacturers to specify USG than any other make.

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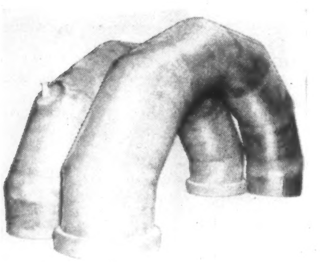
EQUIPMENT DEVELOPMENTS

Continued

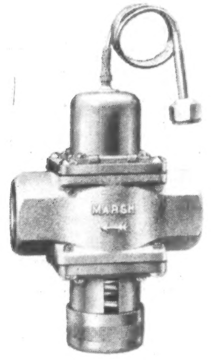
1½, 2, 3, 5, 7½, 10, 15 hp ratings. Recommended by company for applications having high inertia, heavy starting loads but where low running current is necessary.



Fume Ducts . . .

. . . with lightweight, corrosion resistant construction—*Haveg Industries, Inc., Dept. HPAC,* 900 *Greenbank Rd., Wilmington, Del.*

Made of polyester glass, ducts are molded into single piece. Are said to provide high resistance to chemical corrosion of acids, hypochloride salts, weak alkalies, many organic solvents. Line recently expanded to include standard sizes to 24 in. in both rectangular, circular types.



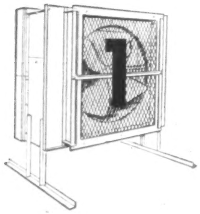
Water Regulating Valves . .

. . . designed with wide continuous adjustment range, 60 to 270 psi—*Jas. P. Marsh Corp., Dept. HPAC,* 3501 *W. Howard St., Skokie, Ill.*

Permits use of unit on either fluorinated hydrocarbon refrigerant No. 12 or No. 22 systems, as well as other common refrigerants, except ammonia, says company. "No. 56" series available in ⅜, ½, ¾, 1 in. sizes.

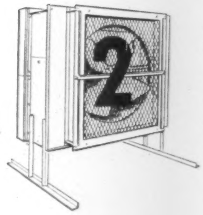
ONLY KRAMER UNICON + WINTERSTAT* GUARANTEES ALL 4

MAXIMUM LIQUID PRESSURE AT EXPANSION VALVE IN WINTERTIME



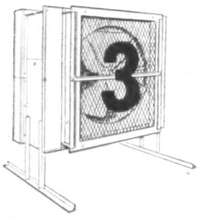
Only the Kramer UNICON plus WINTERSTAT guarantees the full refrigerant pressure *at the expansion valve* for full cooling capacity — even at below 0°F outdoors — *automatically!*

MAXIMUM SUMMER CAPACITY WITH PATENTED WINTERSTAT



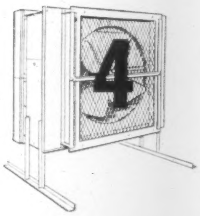
Only Kramer UNICON plus WINTERSTAT guarantees maximum condensing capacity in summer. In hot weather, the patented WINTERSTAT is out of the refrigerant circuit, permitting normal drainage from the condenser without restriction. This assures maximum condensing capacity in summer — *automatically!*

PROMPT DEFROSTING AT ANY OUTDOOR TEMPERATURE



The use of UNICON plus WINTERSTAT makes Kramer THERMOBANK the only low temperature system that can guarantee operation and complete defrosting at any outdoor temperature—even 0°F or lower—*automatically!*

IMMEDIATE COMPRESSOR START-UP REGARDLESS OF OUTDOOR WINTER TEMPERATURE



Only Kramer UNICON plus WINTERSTAT (using modification #1) ensures positive and immediate compressor start-up with pressurestat operating the system, regardless of outdoor winter temperatures at the UNICON and regardless of length of compressor lay-off — *automatically!*

**UNICON is a remote type air-cooled condenser WINTERSTAT is a year 'round automatic head pressure control*

WRITE FOR BULLETIN U-210-L

KRAMER TRENTON CO. • Trenton 5, N.J.

43 YEARS OF CONTINUOUS ACHIEVEMENT IN HEAT TRANSFER

ALADDIN
FANS

for built-in quality

CERTIFIED RATINGS
Certified ratings are the result of tests made by the Manufacturer in accordance with the Standard Test Code for Centrifugal, Axial, and Propeller Fans adopted jointly by the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.
AUTHORIZED BY
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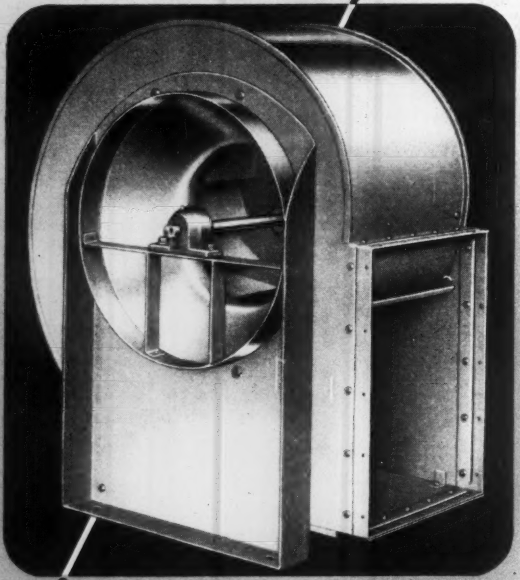
- EFFICIENT
- QUIET OPERATING
- CERTIFIED RATINGS

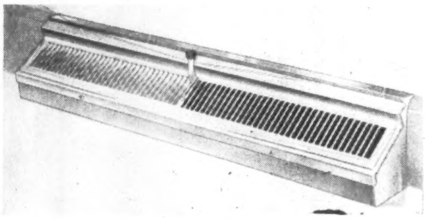
ALADDIN Series 94 Fans are available in 22 sizes of both backwardly inclined and forwardly curved types. Both types have been designed for the lowest rotational speeds consistent with high efficiency over the widest possible range of operating conditions.

Each fan is ruggedly built...fully equal to the job for which it is designed, and is backed by twenty-five years of know-how in manufacturing all types of air handling equipment.

Write for complete data

ALADDIN HEATING CORPORATION
1111 WEST AVENUE 137 • SAN LEANDRO, CALIF.
REPRESENTATIVES IN ALL PRINCIPAL CITIES IN THE WEST





Baseboard Perimeter Diffuser . . .

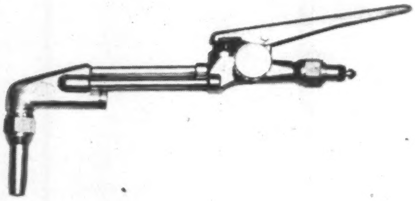
. . . with 34 sq in. free area, "Air Sweep" styling, two-tone finish—*Air Control Products, Inc., Dept. HPAC, Coopersville, Mich.*

"Model 170" delivers wide, fan shaped air pattern which can be varied easily by adjusting fins, says company. Balancing damper can be set at desired cfm. Recommended by company for both heating, cooling installations. Diffuser is 24 in. long, 4 in. high, projects 3 in. at base.

Hermetic Condensing Units . . .

. . . in sizes 1/3 to 7½ hp—*York Corp., Dept. HPAC, York, Pa.*

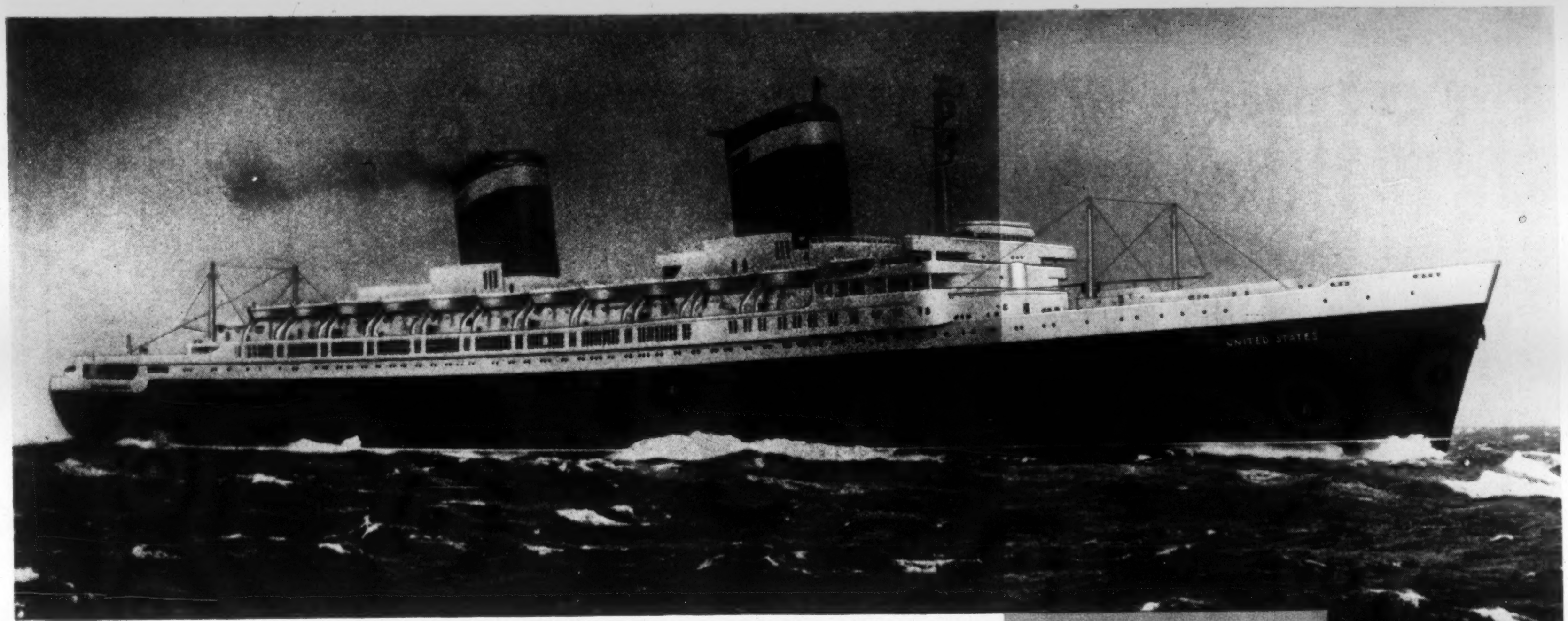
Two refrigerants—fluorinated hydrocarbon refrigerants Nos. 12 and 22—three methods of condenser cooling—air, water, combination air-water—available, says company. Designed for supermarkets, department stores, fur storage plants, hotels, restaurants, other businesses requiring refrigeration. Cited built-in features: compressor sealed in steel with lifetime supply of oil, refrigerant; "Centriforce" lubrication; lightweight aluminum-alloy piston equipped with high tensile strength compression ring; heavy duty motor with high starting torque; no shaft system required since system is hermetically sealed.



Oxyacetylene Cutting Attachment . . .

. . . for light duty use—*Air Reduction Sales Co., Div. of Air Reduction Co., Inc., Dept. HPAC,* 150 *E.* 42*nd St., New York* 17.

Unit attached to company's "Style 400" lightweight welding torch. Cutting range is to 1 in. thick steel. Gas-tight seal assured with tapered gas sealing rings, and hand tightening makes firm joint, says company. With diaphragm type cutting valve designed to eliminate need for valve packing, prevent gas leakage.



BECAUSE DEPENDABILITY IS A MUST THE S. S. UNITED STATES USES TACO CIRCULATORS EXCLUSIVELY*

The world's fastest, most modern luxury liner is the pride of the American merchant fleet. She's fitted out with only the finest products in the world . . . each designed to render that essential dependable performance.

And you can have the same Taco quality circulators with the same Taco dependability on your hot water heating installations that are on the S. S. United States.

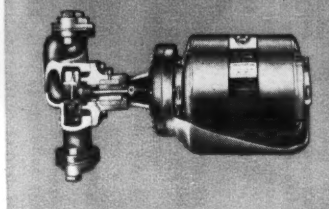
All you need do is specify and buy Taco, because there is *no substitute for TACO quality.* Technical Data Sheets furnished upon request.

**And Taco Heat Exchangers*

TACO HEATERS, INCORPORATED
1160 CRANSTON STREET, CRANSTON 9, R. I.

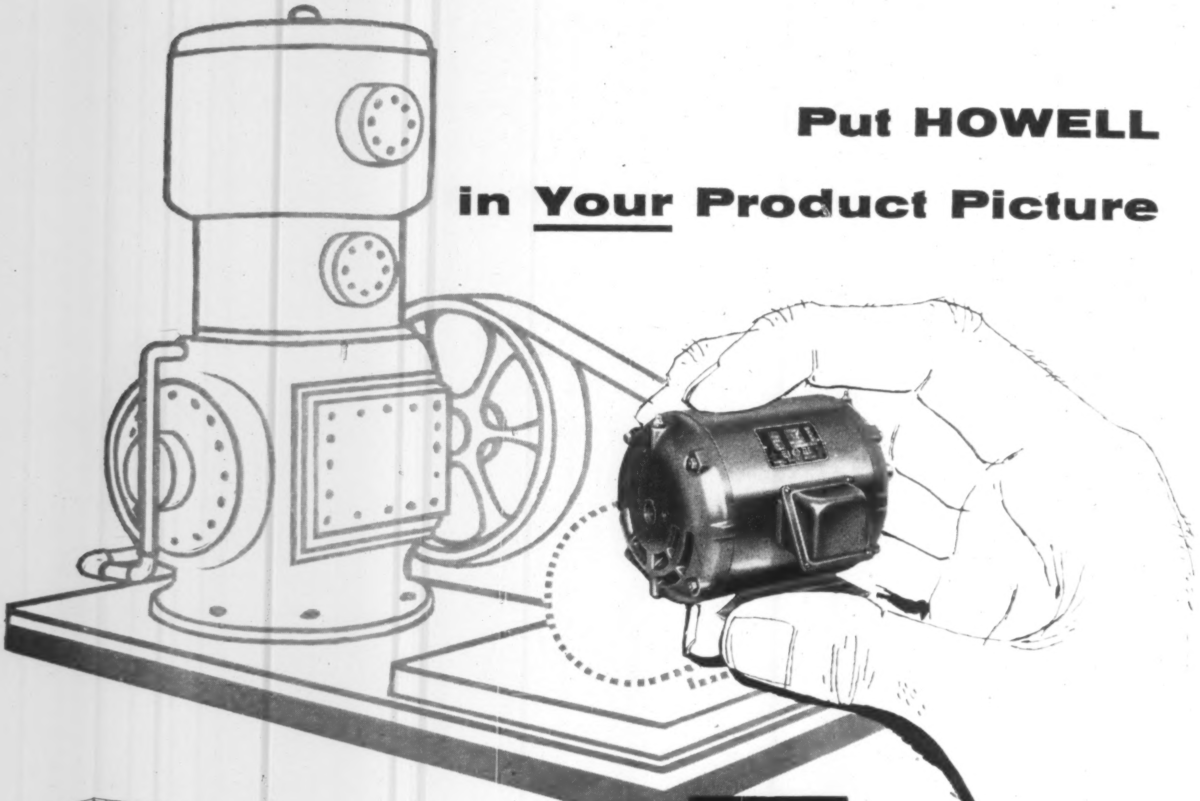
BETTER HEATING Taco BETTER WITH TACO

Corporate Office: 342 Madison Avenue, New York 17, New York
In Canada: Taco Heaters of Canada, Ltd., 4 Gilead Place, Toronto 2

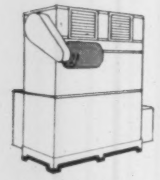


THE POWER-PACKED TACO CIRCULATOR, QUALITY BUILT FOR SMOOTH, QUIET OPERATION

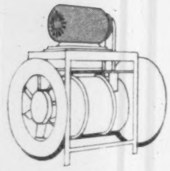
Put HOWELL in Your Product Picture



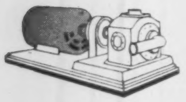
...and gain the PLUS values in power that count!



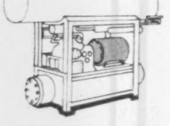
COOLING TOWERS



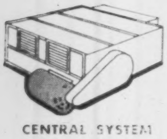
BLOWERS



PUMPS



PACKAGED CHILLERS



CENTRAL SYSTEM CONDITIONERS

Your most efficient air conditioning equipment depends . . . year in and year out . . . on the motor you select to power it. That's why so many manufacturers in the air conditioning industry fill their specifications for integrals, 1 thru 300 hp, with Howell Motors. *Note these features:*

EXTRA DEPENDABILITY that challenges the years. Howell's new principle of heat-source ventilation . . . double sealed bearings . . . tough rolled steel frames and precision fitted cast iron end plates . . . these and many more are plus values that ***count!***

AN UNSURPASSED REPUTATION for engineering excellence and quality manufacture . . . built up by Howell in over 40 years of serving industry's motor requirements.

TOPS IN APPEARANCE. No other industrial motors have such smooth, unbroken contours . . . without an external fin or rib to mar their looks or catch dust deposits.

Howell makes virtually every type of AC industrial motor . . . fractional and integral to 300 hp, in all standard enclosures, in rerated and non-rerated frame sizes, and in many pump mountings. Howell part winding motors, for reduced voltage starting of compressors, pumps, etc., may be of special interest to you.

These motors are specified and used by these leading manufacturers of air conditioning equipment:

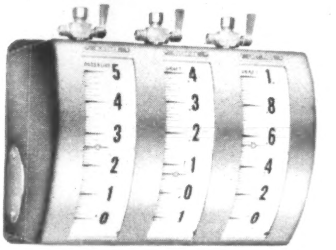
York Corp. ● Acme Industries ● Worthington Corp. ● Frick Corp. ● The Trane Co. ● Binks Manufacturing Co. ● American Blower Corp.

A Howell sales engineer can give you valuable assistance on any motor application. Wire or 'phone collect . . . or drop us a line . . . you'll get prompt action. Howell Electric Motors Co., Howell, Michigan.

HOWELL Red Band MOTORS

HOWELL *motors*

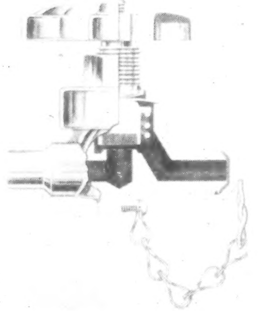
. . . precision built for industry since 1915



Draft Gages . . .

. . .engineered to give instant, accurate, continuous picture of flow of air through boilers—*Cleveland Fuel Equipment Co., Dept. HPAC, 1111 Brookpark Rd., Cleveland 9.*

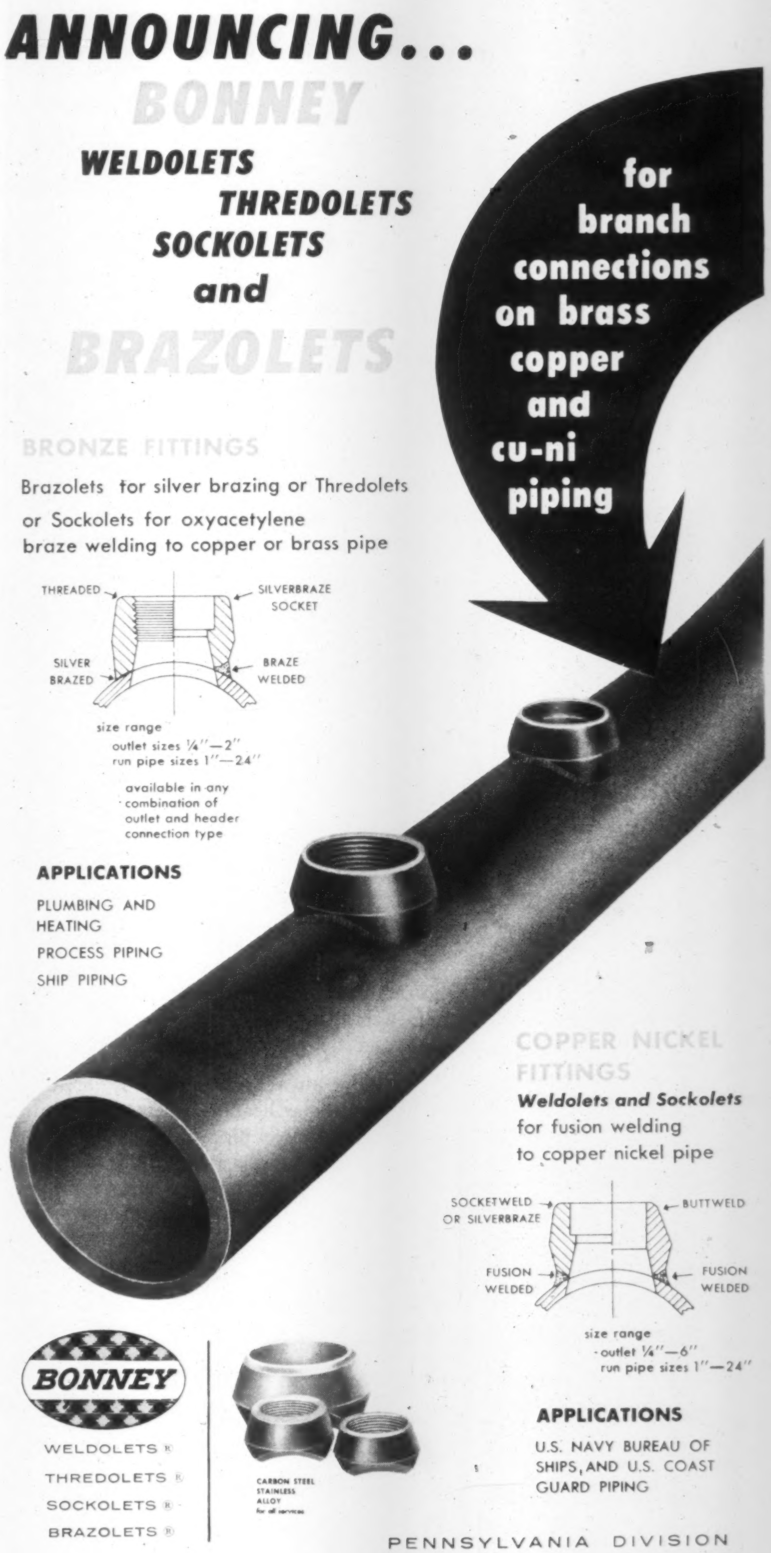
Dry diaphragm, vertical scale "Series MG Multi-Pointer" units designed for applications where readability must go hand-in-hand with space saving installations. Available in two-pointer or three-pointer models which may be combined for multiple installations, says company. For measuring over-fire draft, outlet draft, first and last passes, windbox pressures.



Valve . . .

. . .for refrigeration, air conditioning systems—*Kerotest Mfg. Co., Dept. HPAC, 2525 Liberty Ave., Pittsburgh 22.*

Charge, purge and drain unit features rugged forged brass body with integral mounting flange, beryllium copper and stainless steel diaphragms for high resistance to wear, says company. Maximum operating pressure: 500 psi. Maximum temperature: 200 F. Connection sizes are $\frac{3}{8}$ in. ODS inlet, $\frac{3}{8}$ in. male flare outlet.


ANNOUNCING...
BONNEY
WELDOLETS
THREDOLETS
SOCKOLETS
and
BRAZOLETS

for branch connections on brass copper and cu-ni piping

BRONZE FITTINGS

Brazolets for silver brazing or Thredolets or Sockolets for oxyacetylene braze welding to copper or brass pipe

size range
outlet sizes ¼"—2"
run pipe sizes 1"—24"

available in any combination of outlet and header connection type

APPLICATIONS
PLUMBING AND HEATING
PROCESS PIPING
SHIP PIPING

COPPER NICKEL FITTINGS

Weldolets and Sockolets for fusion welding to copper nickel pipe

size range
outlet ¼"—6"
run pipe sizes 1"—24"

APPLICATIONS
U.S. NAVY BUREAU OF SHIPS, AND U.S. COAST GUARD PIPING

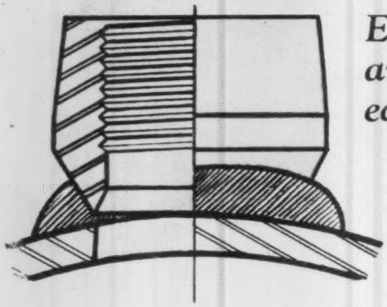
BONNEY
WELDOLETS ®
THREDOLETS ®
SOCKOLETS ®
BRAZOLETS ®

CARBON STEEL
STAINLESS
ALLOY
for all services

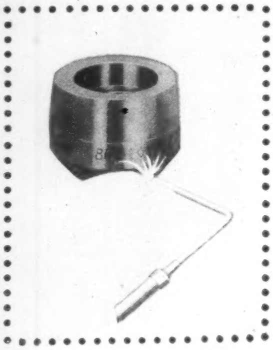
PENNSYLVANIA DIVISION
BONNEY FORGE & TOOL WORKS
Dept. C
ALLENTOWN, PENNSYLVANIA

A New Line of Branch Connections

W-S COUPLETS

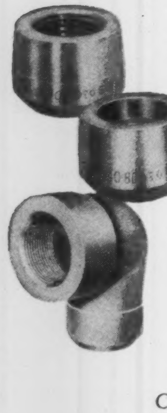


Economical and easy-to-install



Readily modified for small diameter installation

W-S Couplets are designed to function as universal outlet connections for tanks, process vessels and pipelines. They eliminate the need for large, expensive field inventories and costly delays in fabrication.



On most tank, and large piping installations they are used as received. On those few applications where attachment is to be made to a small diameter pipe, the W-S Couplet is easily modified by contouring the welding end with an acetylene torch to mate with the curvature of the pipe diameter. Couplets are made with extra length and heavy wall to permit contouring without detriment to the threaded or socket end.

W-S Couplets are available in sizes ¼" through 2", with screw-end or socket-welding dimensions . . . also in a 90° elbow.

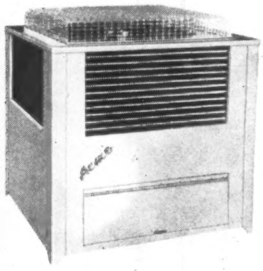
Send for Bulletin CP-1-57. Write to W-S Fittings Division, H. K. Porter Company, Inc., P. O. Box 95, Roselle, N. J.

FORGED STEEL COUPLETS

HKP W-S FITTINGS DIVISION
H. K. PORTER COMPANY, INC.

EQUIPMENT DEVELOPMENTS

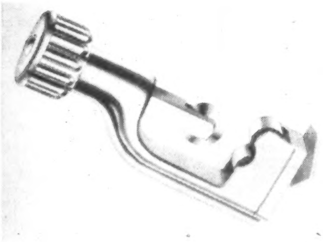
Continued



Liquid Chillers . . .

. . . in two new series, with capacities $1\frac{3}{4}$ to 5 hp—*Acme Industries, Inc., Dept. HPAC, Jackson, Mich.*

For industrial cooling jobs, commercial air conditioning. Water cooled or air cooled packaged "Flow-Pac" units designed to be compact, easy to install. With hermetic refrigeration systems. Shipped with refrigerant charge and factory wired operating and protective controls.



Tubing Cutter . . .

. . . for nonferrous and plastic tubing, thin wall conduit—*Erie Tool Works, Dept. HPAC, 735 W. 12th St., Erie, Pa.*

Range of operation of "Pipemaster 1-T" is $\frac{1}{8}$ to $1\frac{1}{8}$ in. OD. Designed so that all cuts are straight and smooth without distorting tubing. Will operate with minimum effort, says company.

Dual Gravity Traps . . .

. . . designed for interface service to discharge water or heavy liquids and close for light liquids—*Clark Mfg. Co., Dept. HPAC, 1830 E. 38th St., Cleveland 14.*

Discharge valve actuated by stainless steel ball float, weighted to sink in light liquid, float in heavy. Units in-

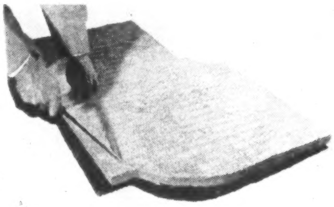
BALDWIN-HILL *Spun Mineral Wool*

DUCT INSULATION

BALDWIN-HILL
BH
INSULATIONS

Over 50,000 sq. ft. of B-H DUCT INSULATION with factory-applied vapor barrier is cutting down heat losses in heating and air conditioning ducts at Westinghouse Electric Corp., Electronics Division, Friendship Airport Plant, Baltimore, Md.

Insulation Contractor:
Wallace and Gale, Baltimore, Md.



⬆ B-H Duct Insulation is easy to cut with a knife to conform to irregular flat shapes.

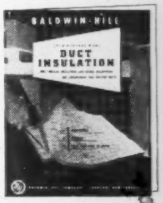
B-H Duct Insulation scored and being molded to curved surface of duct without cracking or breaking. ⬇

Speedy Application Lowers Cost of Insulating and Silencing Ducts

With B-H DUCT INSULATION so easy to apply—because of its light weight, easy cutting and scoring—you'll be the low bidder on many a job and be able to finish in the allotted time.

B-H DUCT INSULATION is made in semi-rigid sheets of spun mineral wool fibers, from 3/4″ to 2″ thick in nominal 7 lb. density. It is furnished with or without vapor barrier, or coated to prevent fiber entrainment. It is adaptable to various application methods—adhesive, clips, bands, screws and pins. With a smooth, clean surface, it is handled with bare hands—no splinters or fall-out of loose particles.

Send for literature describing B-H DUCT INSULATION
and giving suggested methods of application
For other B-H products, see Sweet's Engineering File



BALDWIN-HILL COMPANY

1705 Breunig Avenue **Trenton 2, New Jersey**

Kalamazoo, Mich. . . . Huntington, Ind. . . . Temple, Tex.

FOR HOT CORROSIVES:
ACE TEMPRON

Heat-resistant nitrile hard rubber pipe handles inorganics at 250-275 deg. F. . . also resists wide range of organic chemicals at room temperature. Sizes 1" to 8", *Bulletin 96-A.*

Only the
Right piping
can deliver a
"GOOD RUN"

For profitable runs you must keep equipment "on stream" full time with no corrosion shut-downs. Protect your profits with Ace piping, pumps, valves, and tanks. Many rubber and plastic materials . . . backed by a century of chemical experience. Get facts today from American Hard Rubber Company.

VALVES
for all-plastic piping systems

Trouble-free plastic diaphragm valves . . . choice of general-purpose ACE-ITE, ACE PARIAN (polyethylene) or ACE SARAN. Handles most corrosive chemicals and food ingredients. Sizes ½" to 2", 50 psi. at 77 deg. F. *Bulletins 80 and 351.*

RIGID VINYL . . . STRONG,
AGE-PROOF

ACE RIVICLOR is a new rigid threaded plastic pipe with good aging and high impact strength. Not affected by most inorganic acids and alkalis, also excellent for many organics. Sizes ½" to 4". *Ask for Bulletin CE-56.*

STAYS TOUGH
AT SUB-ZERO TEMPERATURES

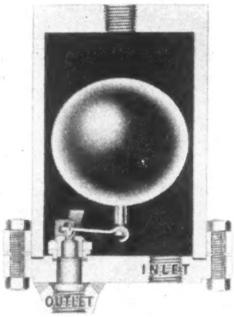
ACE PARIAN . . . odorless, tasteless, rigid polyethylene. Best chemical-resistance of any plastic at room temp. except to acetic acid. Excellent impact strength at sub-zero temp. Rigid pipe ½" to 2". *Bul. 351.*

TOUGH ACE-ITE PLASTIC PIPE

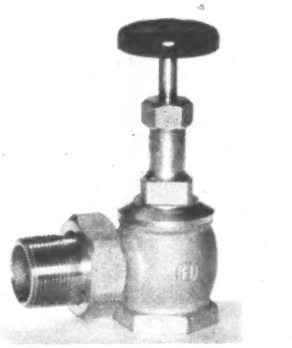
General-purpose moderately priced rubber-plastic pipe handles most common chemicals to 170 deg. F. . . . except few strong acids and organic solvents. Tough, odorless, tasteless. Rigid pipe ½" to 6". *Bulletin 80.*

ACE processing equipment of rubber and plastics

AMERICAN HARD RUBBER COMPANY
93 WORTH STREET • NEW YORK 13, N. Y.



corporate company's "Duo-Step" leverage principle, which uses two fulcrum points to develop maximum power and travel, says manufacturer. In two series: semi-steel for low temperatures to 300 psi; fabricated steel for low temperatures to 1000 psi.



Angle Valve . . .

. . . for steam radiators—*Hammond Brass Works, Dept. HPAC, 1844 Summer Blvd., Hammond, Ind.*

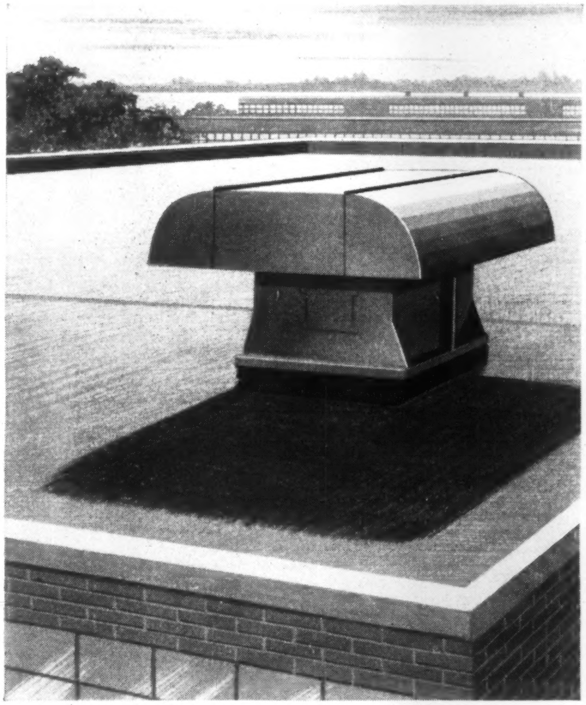
Heavy duty unit has angle female inlet and union male outlet designed for 200 lb steam pressure. Features oversized bonnet and stem to accommodate high pressure service, says company. Gland follower, double packing, extra large stuffing box are said to assure leakproof performance.

Rotary Vane Type Pumps

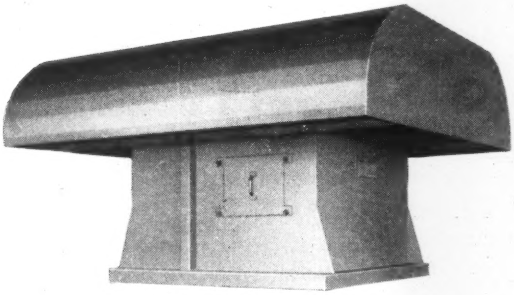
. . . for corrosive liquids—*Procon Pump & Engineering Co., Dept. HPAC,* 12721 *Capital Ave., Oak Park* 37, *Mich.*

With capacities 35 to 275 gph,

FROM SPOT VENTILATION . . . TO LARGE-AREA SYSTEMS



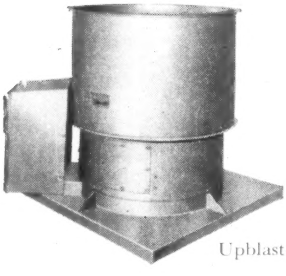
. . . independent, roof-mounted units offer balanced ventilation, plant-design flexibility!



Hood-type for supply
or exhaust duty

Right in step with the trend to modern plant design, economical American Blower Power Roof Ventilators provide flexible ventilation to fit changing industrial needs. Each unit is individually operated and may be relocated, or additional units may be added, if buildings are changed or enlarged. Roof-mounted, they do not take up valuable floor space, nor does extensive ductwork interfere with overhead crane-ways. And being power operated, they may be located without regard to wind direction or temperature differentials.

Two types of American Blower exhaust and supply Power Roof Ventilators are available: hood-type and upblast-type. For full details, call your nearest American Blower Branch Office; or write: American Blower Division of American-Standard, Detroit 32, Mich. In Canada: Canadian Sirocco products, Windsor, Ont.



Upblast-type Exhaust Ventilator

AMERICAN BLOWER

Division of **American-Standard**

FOR
QUIET
PERFORMANCE...

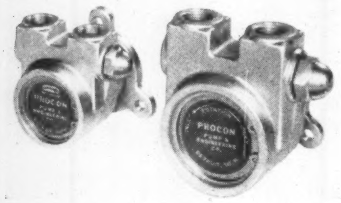
use
Chicago
Airfoil Fans

Its aerodynamically designed blades reduce noise level 65%, cut horse power requirements 35%. Capacities, 600 to 1,000,000 cfm.

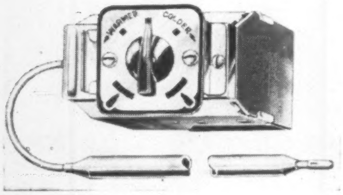
Write for
Bulletin A-102H

CHARTER MEMBER of A.M.C.A.

CHICAGO
BLOWER CORP.
9869 Pacific Ave., Franklin Park, Ill.
See Phone Directory for Sales Offices



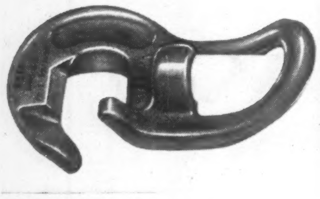
pressures to 300 psi, suction lift to 28 in. mercury. For corrosive liquids, fluids at 375 F. Especially adapted for water, fuel oil, hydraulic oil, gasoline, many chemicals, including ammonia, says company. Engineered for quiet operation, long operating life.



Control . . .

. . . designed to automatically operate up to four individual devices on air conditioning systems—*Ranco, Inc., Dept. HPAC, 601 W. Fifth Ave., Columbus, Ohio.*

"C17" derives its versatility from two electrically-independent, single-pole, double-throw switches, says company. Both operated by single temperature power element and permit up to four switching combinations for cut-in, cut-out operation.



Pipe Puller . . .

. . . designed for vertical lifts on $\frac{3}{4}$ to 2 in. pipe—*Reed Mfg. Co., Dept. HPAC, 1425 E. Eighth St., Erie, Pa.*

Made of ductile iron with hardened jaws, unit is said to withstand stresses in excess of 10,000 lb. De-

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This practical book is made up of outstanding papers and data on industrial piping selected from past issues of "Heating, Piping & Air Conditioning." It is a most comprehensive collection of case studies, showing how various difficult piping problems encountered in different industrial plants were successfully worked out by piping experts.

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Designed for low noise level

Air conditioned comfort without hum

Commercial air-conditioning installations use Louis Allis "quiet" motors

In today's modern executive and general offices, silent operation is a prime specification for the air-conditioning installation. Busy people suffer adversely from any resonance or hum induced in the system by the drive motor. Efficiency drops — irritability climbs — and worker output falls.

That's why Louis Allis motors — the motors with the built-in "hush" — are finding wide acceptance in air-conditioning service. They are specifically *designed* to be quiet. Every bearing is noise tested . . . end bells and frame are engineered for low, low noise levels . . . sturdy, heavy-section cast-iron housing construction is remarkably resonance-free. Matching this desirable operating characteristic is dependable maintenance-free construction: locked bearings mean extra long bearing life, and Louis Allis insulation protects against moisture and heat to assure steady, dependable performance even under the most adverse operating conditions.

Make us prove it. Contact your Louis Allis District Office and arrange to have an expert motor sales engineer stop by and advise you on your air-conditioning drive installation. Or write the Louis Allis Co., 453 East Stewart St., Milwaukee 1, Wisconsin.

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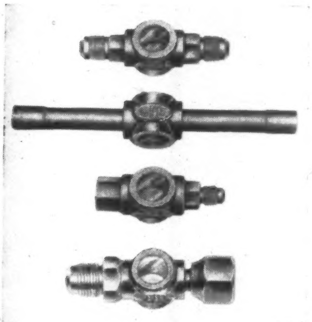
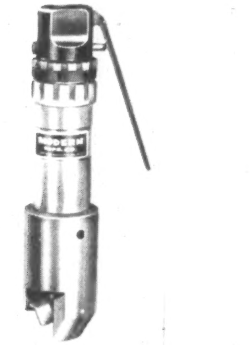
MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES pending upon condition of old line and subsoil, runs of as much as 75 ft can be handled in this way.



Liquid Indicators . . .

. . . for refrigeration use—*McIntire Co., Dept. HPAC, Livingston, N.J.*

Nondirectional, double-port units have hermetically sealed glass-to-metal and metal-to-metal joints, which, according to company, will remain permanently leakproof. Designed with large "clear-view" windows on both sides. Line includes 16 connection sizes in male and male threads, male and female threads, flare nut and male threads and with copper tube extensions for sweat or solder connection.

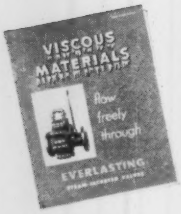


Pittsburgh Lock Hammer . .

. . . designed "turn any sheet metal locking edge in seconds"—*Modern Mfg. Co., Dept. HPAC, Willow Grove, Pa.*

Air powered unit is said to do the job in one pass—fast, clean, smooth, without dents. For handling 30 to 24 gage sheet metal.

VISCOUS MATERIALS
Flow Freely
through
Steam-Jacketed
EVERLASTING Valves
EVERLASTING



The EVERLASTING Steam-Jacketed Valve has proven outstandingly successful in handling many different kinds of viscous materials, such as tar, asphalt, pitch, paraffin, waxes, molten sulfur, etc.

Available in sizes 1½ in. to 6 in. inclusive, in iron body for 125 psi and cast steel for 150 psi.

For further details, write for Bulletin E-200.

For "everlasting" service, use

EVERLASTING *Valves*

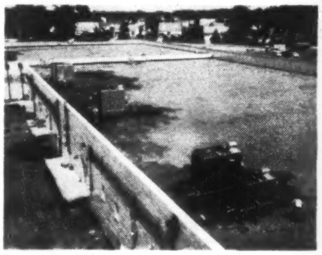
EVERLASTING VALVE CO.
61 FISK STREET, JERSEY CITY 5, N. J.

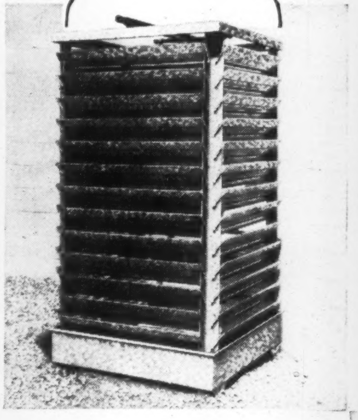
EV390

CHECKMATE RUST
WITH DOVER COOLING TOWERS*

***HOT-DIP GALVANIZED AFTER FABRICATION**

THE fact that all Dover towers are hot-dip galvanized after fabrication was one big reason air conditioning contractors chose Dover towers for the new Mission, Kansas, shopping center. They also liked these other Dover features . . . all offered at no additional cost: 1) stainless steel propeller fan and shaft for long life and trouble-free performance; 2) "take apart" design for easy installation in hard to reach spots; 3) "honeycomb" redwood fill construction prevents channeling of air through tower and loss of efficiency. Dover towers are truly America's New Standard in packaged cooling towers.



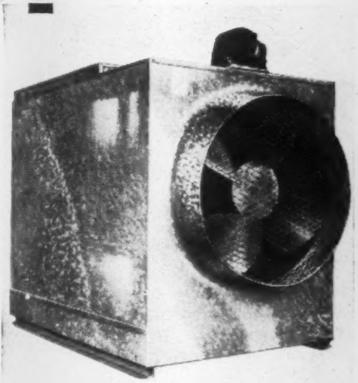


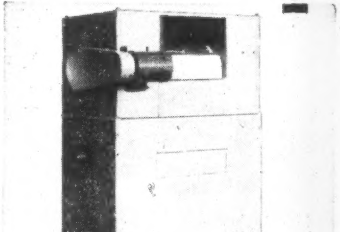
Series K — All-Steel
Series S — Steel and Redwood
Natural Draft Towers

Available from 2 to 225 tons, they feature bolt-free construction. Series K is perfect for installation where fire codes demand all-steel construction. Series S, somewhat lower-priced, has redwood parts and louvers, and steel basins and crowns.

Series CF **Horizontal Induced Draft Tower**

. . . with propeller fan, from 2 to 100 tons capacity. Well suited for small air conditioning and refrigeration installations, or jacket water cooling. The Series CF is compact, rugged and handsome in design. Built for years of efficient operation.





Vertical Induced Draft Tower Series V
for installation where ductwork is a factor. Has a minimum of piping and is extra quiet in operation. Sizes 5 to 100 tons.

MAKE YOUR NEXT MOVE NOW!

Send today for Dover's catalog illustrating their complete line of packaged cooling towers. Dover checkmates rust and gives dependable, efficient service.

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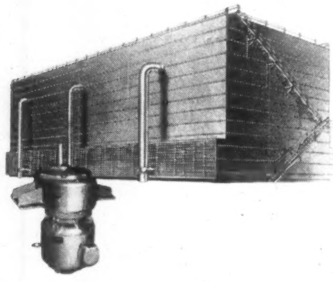
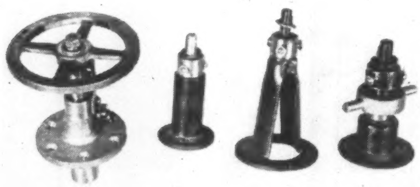
Roof Ventilators for Every Commercial and Industrial Need
REPRESENTATIVES IN PRINCIPAL CITIES



Cooling Tower . . .

. . . with vertical gearmotor designed especially for cooling tower service—*G. W. Galloway Co., Cooling Tower Div., Dept. HPAC, 220 W. First Ave., Arcadia, Calif.*

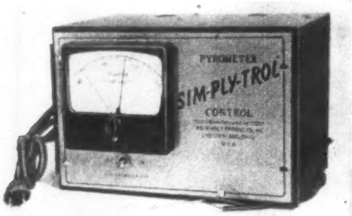
Gearmotor (shown in inset) designed to eliminate right angle gear units, shafts, flexible couplings. Tower built of nonleaching "Chemonited" Douglas fir for longer life, resistance to fungus attack, says company. With stainless steel hardware for corrosion resistance.



Flexible Shaft Terminals . . .

. . . for valve control—*Stow Mfg. Co., Dept. HPAC, 350 Shear St., Binghamton, N.Y.*

Valves can be easily controlled at any point from remote location, says company. Terminals include: valve couplings, intermediate connections to go through floors, remote operating stations.



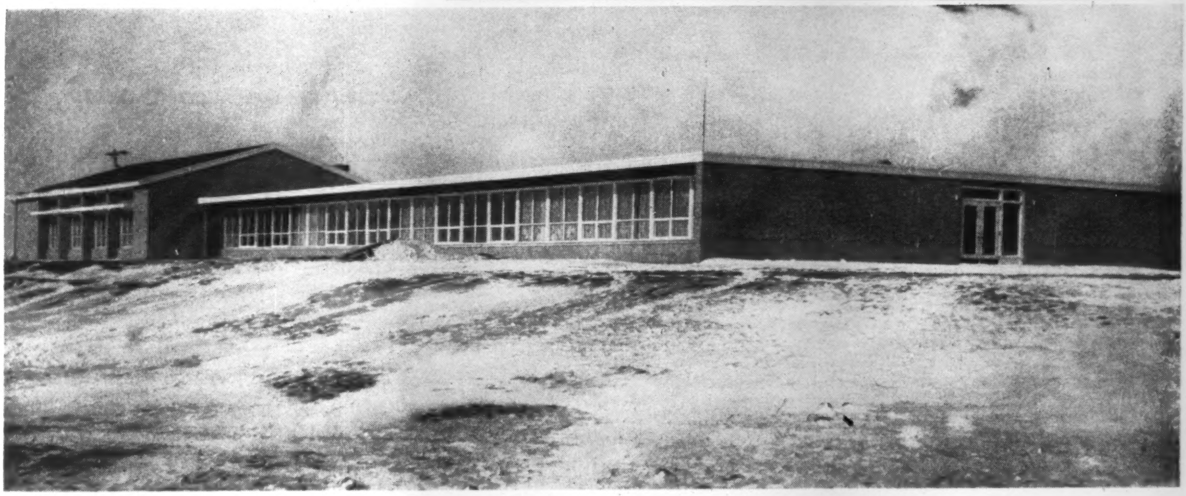
Temperature Control Units . . .

. . . said to have high sensitivity of thermistor bridge circuit combined with dual indicating and controlling function of contact meter-relay—*Assembly Products, Inc., Dept. HPAC, Chesterland, Ohio.*

Is said to act upon temperature change as small as 0.075 F deg. Models available in number of temperature ranges.

Campbell

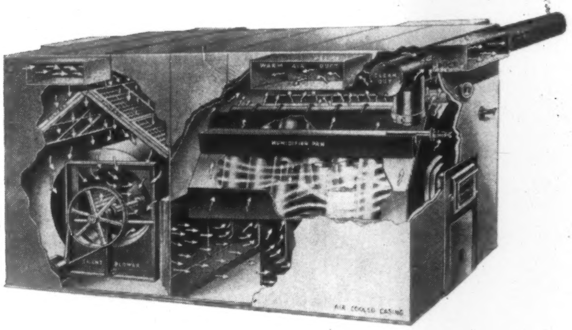
WARM AIR HEATERS FOR LARGE BUILDINGS



Elementary School, Minot, N. D., comfortably warm air heated with a single oil-fired Campbell 8000 Series Heater. School has eight classrooms, a large multi-purpose room, kitchen and offices, totaling approximately 15,000 square feet. Installed in 1954 by M & S Roofing and Sheet Metal Co., Minot. Architect, Ira. L. Rush, Jr., Minot, N. D.

PRACTICAL HEATING FOR SCHOOLS

Campbell Heaters make full use of all the natural advantages of warm air heating. Fast heat delivery, positive control of temperature, humidity and ventilation, plus quiet operation and exceptional fuel economy are advantages that make Campbell Units especially practical for school heating. Low first cost and low installation cost are plus values. Available for all fuels in capacities up to 3,150,000 BTUs.



MANUFACTURERS' AGENTS

We have some very attractive openings for men calling on heating contractors and architects.

CAMPBELL
HEATING COMPANY

DES MOINES 17, IOWA

POLYETHYLENE INSULATION
VINYL PLASTIC
STRANDED COPPER CONDUCTOR
SEMI-RIGID VINYL PLASTIC
SOLID COPPER CONDUCTOR
FLEXIBLE VINYL JACKET OR WAXED COTTON OVERBRAID
GALVANIZED STEEL ARMOR
ANTI-SHORT BUSHING
WAXED CRAFT PAPER
VINYL PLASTIC OR RUBBER INSULATION

Dependable heating begins with the wiring...

CHESTER

plasticord-plasticote®

WIRES and CABLES

—*including*

Flexible Steel Conduit
TW Building Wire
Non-Metallic Sheathed Cable
Appliance, Instrument Wire

Oil Burner Ignition Cable for damp locations—special construction resists deterioration due to oil, grease, grit. This Chester oil burner ignition cable is UL approved.

Braided or Jacketed Thermostat Cable—multi-conductor wire for temperature control. Features flexible Vinyl jacket or waxed cotton overbraid for trouble-free circuits.

Armored Bushed Cable—available in standard wire sizes both solid and stranded in single, two, three and four conductors. Armored lead cable furnished in standard wire sizes.

Super-rugged Chester Insulations resist Oil, Grease, Water, Grime—

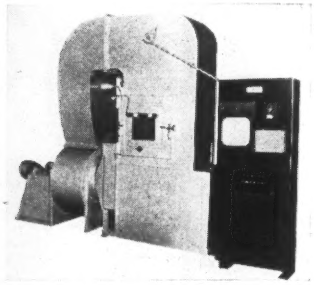
Chester Plasticote and Plasticord coatings withstand severe environmental conditions... add years to wiring life. The smooth pliability of these durable Chester conductors makes them easier working, faster to install. For faster installations and improved wiring performance, connect it with Chester! All wire and cable constructions *exceed* service requirements. Call or write for wire samples and bulletins today.

CHESTER
CABLE CORP.
30 HILL STREET, CHESTER, NEW YORK

A Subsidiary of Miami Copper Company

EQUIPMENT DEVELOPMENTS

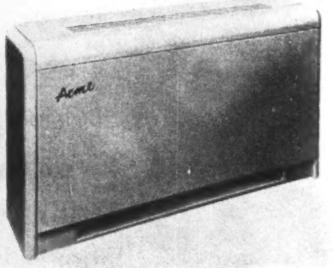
Continued



Sand and Dust Chamber . .

. . . available with complete instrumentation—*Tenney Engineering, Inc., Environmental Div., Dept. HPAC, 1090 Springfield Rd., Union, N.J.*

Environmental test chamber stabilizes composition, density level of sand and dust by continuously purging small amount of dust-laden air which is recirculated to exhaust outside of chamber. Makeup air, sand and dust replace exhausted air. Furnished with full opening door, viewing window.



Air Conditioners . . .

. . . for hotels, apartment buildings, hospitals, motels, office buildings, other multiroom structures—*Acme Industries, Inc., Dept. HPAC, Jackson, Mich.*

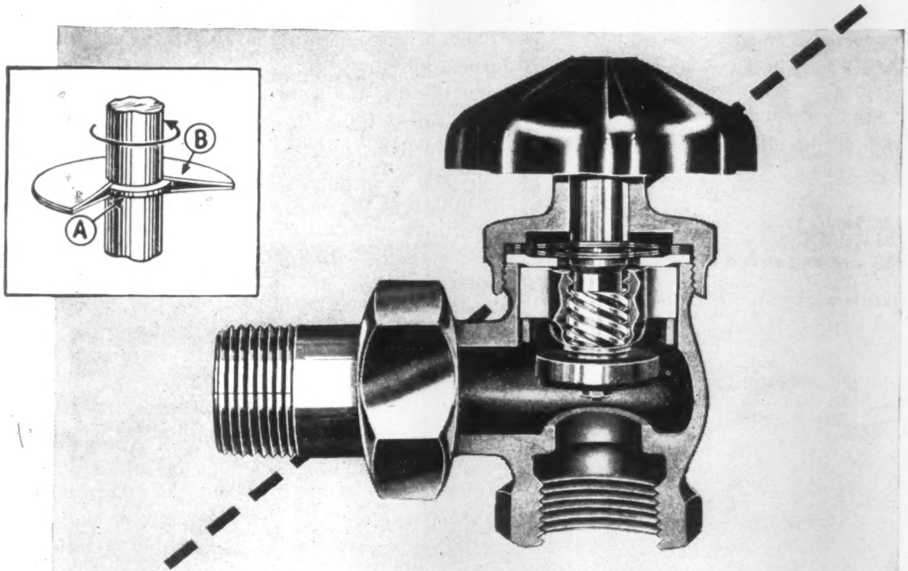
"Flow-Temp" units rated ½ to 2 tons. In four types, each available in four sizes (200, 300, 400, 600 cfm). For operation either with water or fluorinated hydrocarbon refrigerant.

Adhesive Tapes . . .

. . . for sealing ductwork, insulation—*Arno Adhesive Tapes, Inc., Dept. HPAC, Michigan City, Ind.*

Cloth-back tapes formulated to:

A Valve that is



PACKLESS in fact

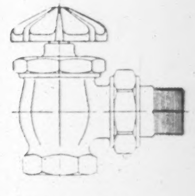
. . . *not just packless in name*

When the job calls for the kind of valve that will stand up across the years —when it calls for a valve that is packless in the full meaning of the word— then, no matter how far you look, you'll find in the Marsh Packless the only valve that completely fills the bill.

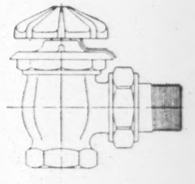
In fact, many users consider this the only valve that is packless in fact as well as in name, and they have a good reason for this. There is a difference between pack less and packless! The diagram tells the story of Marsh truly packless construction. A collar (A) is machined on the valve stem. The stainless spring steel wafers (B) press against this collar to form a tight annular seal This, you see, is a metal-to-metal seal—*permanently* leakproof.

And this better construction is typical of the quality and refinement found throughout the Marsh Packless Valve—in the swivel, self-seating, self-cleaning disc—in the excellent proportioning, machining, workmanship and finish.

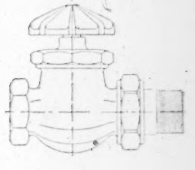
Packed valves can and do "blow out", scalding or burning the operator. This danger is avoided when you use the Marsh Packless. It is a valve you can rely on for any service up to 100 lbs. Furnished in a wide range of patterns including graduated and extended stem types, the Marsh Packless Valve is widely used for steam and hot water heating systems, coffee urns, steam kettles, sterilizers, ovens and similar services. Ask our representative or engineering department for facts.



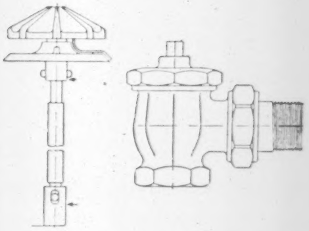
Wheel Angle



Wheel Angle Graduated



Globe



Extension stem

MARSH HEATING EQUIPMENT CO. *Sales affiliate of Jas. P. Marsh Corporation*
Dept.T, Skokie, Ill. Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta

MANUFACTURERS OF GAUGES • THERMOMETERS • WATER REGULATING VALVES • SOLENOID VALVES

MARSH SINCE 1865

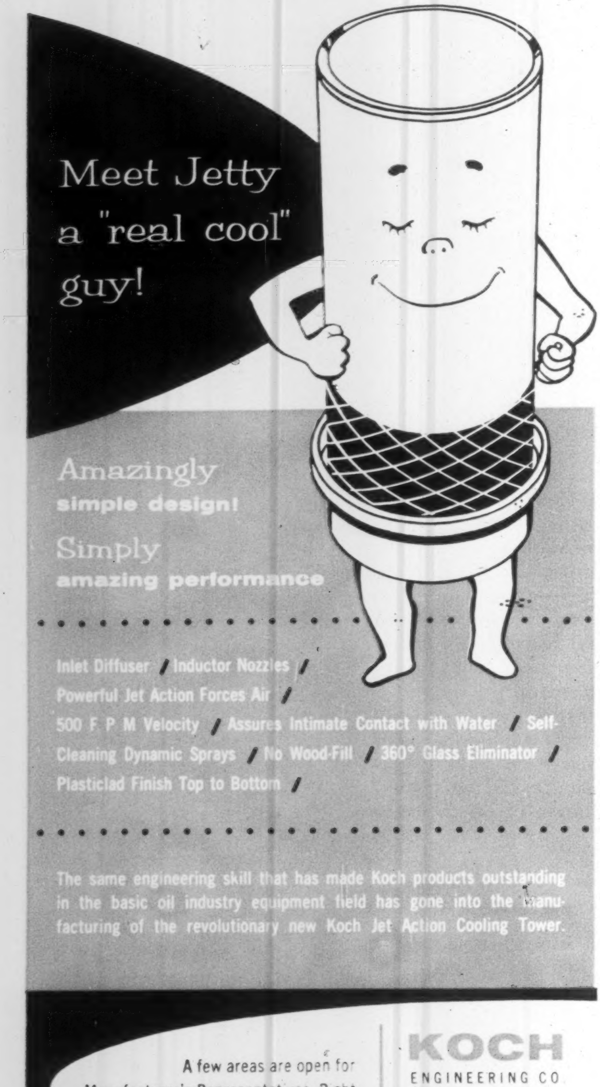
Quality Heating Specialties

KOCH
JET — forced draft
COOLING TOWER

An amazingly efficient tower that combines the simplicity of natural draft towers with all the efficiency of a forced draft tower.

- **no moving parts!**
- **installs easily...anywhere!**
- **compact...attractive!**
- **COST LESS!**

Available sizes match all self-contained air conditioners 3 to 25 tons



Amazingly
simple design!
Simply
amazing performance

Inlet Diffuser / Inductor Nozzles / Powerful Jet Action Forces Air / 500 F P M Velocity / Assures Intimate Contact with Water / Self-Cleaning Dynamic Sprays / No Wood-Fill / 360° Glass Eliminator / Plasticlad Finish Top to Bottom /

The same engineering skill that has made Koch products outstanding in the basic oil industry equipment field has gone into the manufacturing of the revolutionary new Koch Jet Action Cooling Tower.

A few areas are open for Manufacturer's Representatives. Right now . . . write for information.

KOCH
ENGINEERING CO
321 West Douglas
Wichita, Kansas

EQUIPMENT DEVELOPMENTS

Continued

save labor; increase efficiency of duct system; add to finished appearance through matching colors; have sufficient tensile and adhesive strength to eliminate, in some cases, need of other fastenings at joints. Available in flame resistant, non-flame resistant types.

Pressurized Filter-Drier . . .

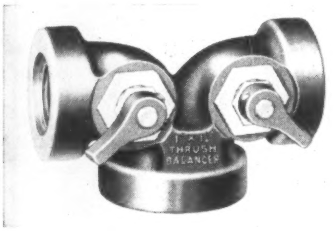
. . . designed to guard against moisture, dirt, acids—*Refrigeration Research, Inc., Dept. HPAC, 9901 E. Grand River, Brighton, Mich.*

"Bulldog" is strainer-drier and filter combination pressurized with −70 F dew-point air. Available in ratings ¼ to 10 hp. with connections for ¼ to ⅝ in. diameter tubing.

Copper Refrigeration Tube . . .

. . . in eight sizes ⅛ to ¾ in.—*Brass & Copper Tube Div., Triangle Conduit & Cable Co., Inc., Dept. HPAC, New Brunswick, N.J.*

Tube is dehydrated, deoxidized, dead soft, bright annealed, ends sealed and produced in 50 ft coils, says company.



Balancer . . .

. . . for joining two flow or return branch mains into one common main—*H. A. Thrush & Co., Dept. HPAC, Peru, Ind.*

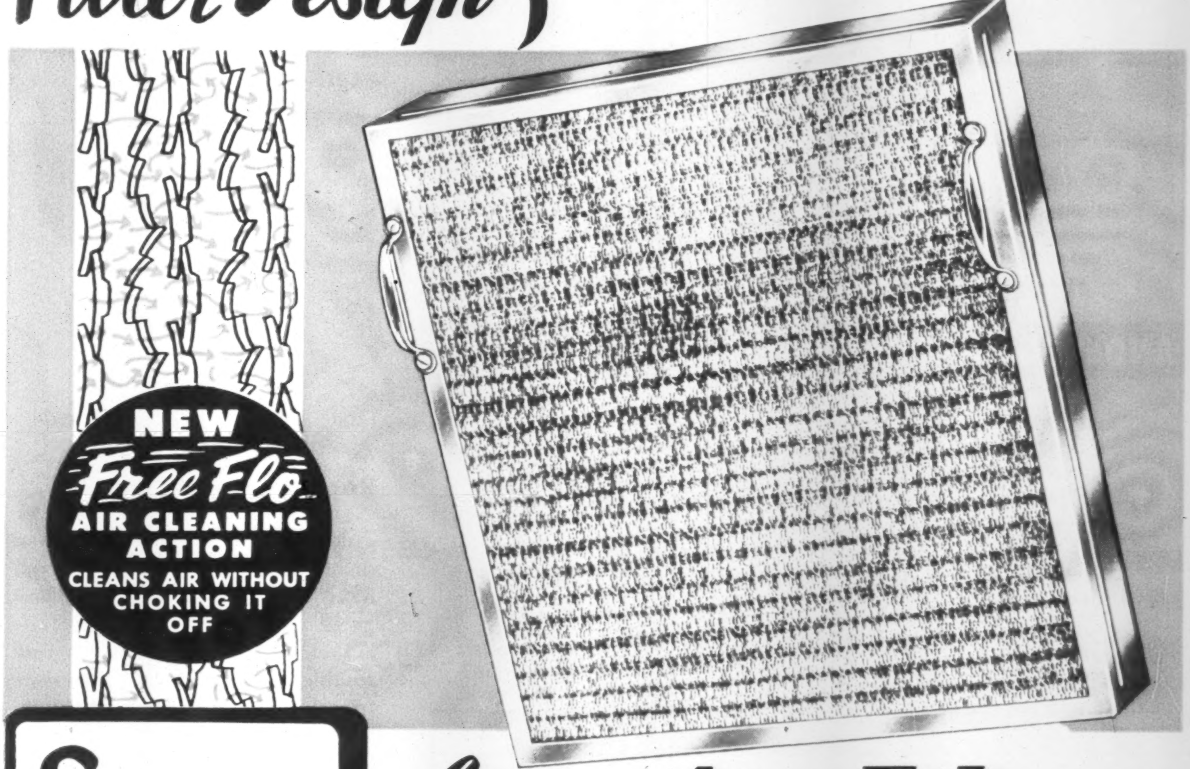
"Twin-L" has built-in balancing valves designed to balance flow in each branch main. May also be used as bypass valve in radiant heat installations to divert return water around boiler to be mixed with hot water leaving boiler, says company. In two sizes in both bronze and cast iron: 1 × 1 × 1¼ in., 1¼ × 1¼ × 1½ in.

Vacuum Cleaner . . .

. . . with 1 2/3 bu or 10 gal tank capacity—*Kent Co., Inc., Dept. HPAC, 716 Canal St., Rome, N.Y.*

NEW *Filter Design*

29% SLOWER RESISTANCE RISE ...per gram of dirt caught


NEW
Free-Flo
AIR CLEANING ACTION
CLEANS AIR WITHOUT CHOKING IT OFF

Evans *Lifelong* Air Filters

Super cleans the air . . . yet maintains FULL FLOW AIR DELIVERY

As filter loads, rate of static pressure rise is low and slow. Low resistance permits faster release of cooled air from cooling coils. Thus blower delivers at peak efficiency all during cooling cycle. No sudden jump . . . no sharp vertical rise in resistance. Air delivery system remains in balance. Resistance rise is slow even from 0.50" water gauge to 1.00" or 1.50" water gauge. High lint (or fibrous material) content in the air does not change this performance.

BIG CAPACITY DESIGN

Enables Evans filter to catch and hold lint without choking off air stream (particularly desirable in super markets, department stores, hospital, textile plants, and so forth where there is high lint content in the air).

EXTRA HEAVY LIFETIME CONSTRUCTION

All aluminum (heavy gauge). Every part precision made—precision assembled.

SAVE 50% ON CLEAN AIR MAINTENANCE COSTS

One set of Evans filters last the life of the air handling system. No messy high-tension adhesive oil. Evans fluid has *built-in* detergent to help clean filters. Hose out with ordinary tap water. Light-weight, extra easy to handle.

MAIL COUPON FOR FREE LITERATURE

THE GEORGE EVANS CORP. • Moline, Illinois

Gentlemen: Rush me full details on the NEW HIGH CAPACITY EVANS FILTER that has a 29% slower static pressure rise per gram of dirt caught.

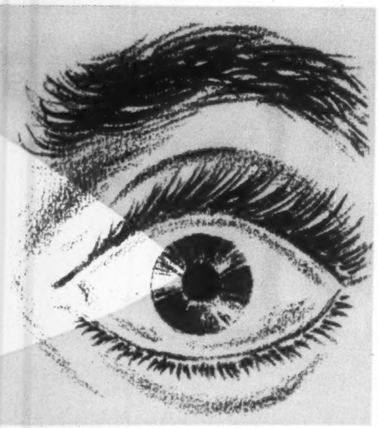
NAME ______________________

COMPANY ______________________

ADDRESS ______________________

CITY ____________ **STATE** ____________

HERE'S A
STEAM TRAP
EYE OPENER!



● Don't be misled into thinking that one type of steam trap meets all requirements. Each type of trap has a purpose—operates efficiently only under certain conditions. The correct selection of the right type of trap for each application pays for itself by draining *all* condensate and venting *all* air in the *shortest* possible time.

ANDERSON STEAM TRAP SELECTION GUIDE

Super-Silvertop INVERTED BUCKET

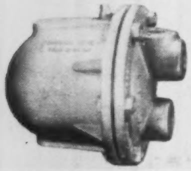
For normal inside uses. More efficient since condensate, rather than temperature differentials, actuates the trap. Patented guided bucket arrangement eliminates bucket damage and assures positive seating.

Heat-Kwik COMBINATION BUCKET AND THERMOSTATIC

For extremely fast heating up. Unique combination design vents air eight times faster from cold units. Permits production units like cookers, dryers, autoclaves, kettles to reach maximum capacity in 2½ minutes.

Quik-Flex THERMOSTATIC

For all outdoor applications. Wherever a freeze-proof trap is required such as tracer lines, meter boxes, etc. Particularly recommended for refineries, chemical, petrochemical and other outdoor type plants.



Anderson FLOAT Traps

For continuous trapping. Such as ahead of condensate meters (bucket traps operate intermittently). Also for draining moisture and entrainment from *air* and *gas* pipelines, purifiers, separators and other equipment.

THE V. D. ANDERSON COMPANY
division of International Basic Economy Corporation • 1949 West 96th Street • Cleveland 2, Ohio, U.S.A.

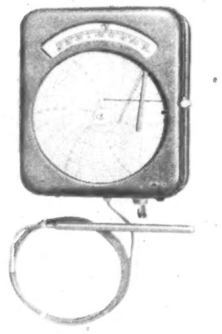
YES I want to use the right steam trap. Please send information on the following types:

☐ Inverted bucket
☐ Combination
☐ Thermostatic
☐ Float

Name__________
Company__________
Address__________
City__________ Zone____ State__________

QUALITY STEAM TRAPS SINCE 1886

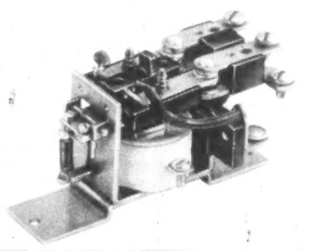
Cited application is tough boiler cleaning operations. Features of "Model 75," says company, are lower cost, medium weight for easy maneuverability, "Auto-Lift" for easy removal of tank. With 1 hp bypass type motor. Intake volume is 135 cfm of air. Filter area is 1000 sq in.



Recording, Indicating . . .

. . . instrument with large indicating scale and pointer incorporated into standard model—*Dickson Co., Dept. HPAC, 7422 Woodlawn Ave., Chicago 19.*

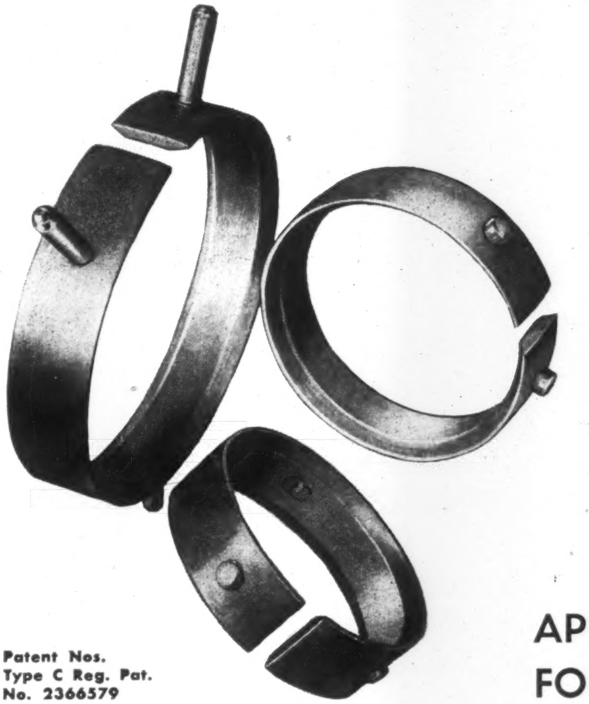
Feature is said to provide for easy reading of temperature or pressure from a distance. Fluorescent pointer indicates temperature or pressure being recorded on chart below. For recording facts relative to temperature, pressure, vacuum, electrical operation, mechanical motion.



General Purpose Relay . . .

. . . with interchangeable coils, removable multiposition base—*Wheelock Signals, Inc., Dept. HPAC, Long Branch, N.J.*

Rated at 20 amps, 115 volts, 60 cycle a-c or 24 volt d-c, contacts are



Patent Nos.
Type C Reg. Pat.
No. 2366579
Type CC & CCC Reg. Pat.
No. 2764426

ROBVON BACKING RINGS

APPROVED BACKING RINGS FOR WELDED PIPE, VALVES, AND FITTING JOINTS

AVAILABLE IN CARBON STEEL, WROUGHT IRON, CHROME ALLOYS, STAINLESS STEEL, ALUMINUM AND COPPER.

TYPE CCC	Designed for quick easy alignment of pipe where the variation in inside diameters is relatively great. Chamfered NUBS allow close tolerance fit-up and CLEAN STRIKE OFF. The ROBVON NUB conforms to the diameter of weld rod. ROBVON rings are beveled to assure non-restricted fluid flow.
TYPE CC	Designed to allow quick easy alignment of pipe where the inside diameters are slightly out of round. The welder has the choice of "STRIKING OFF" the NUBS or leaving them intact to be melted into the weld mass of the first root pass.
TYPE C	Designed for precise close tolerance fit-up. Type "C" NUBS conform to the diameter of the weld root. The NUBS melt with the metal to give complete penetration and fusion.

ROBVON ALSO MANUFACTURES MACHINED RINGS
TO CUSTOMERS SPECIFICATIONS.
ALL FABRICATED SOLID MACHINED RINGS X-RAYED
WRITE FOR FULL INFORMATION

ROBVON
BACKING RING COMPANY

675 GARDEN STREET **ELIZABETH, NEW JERSEY**

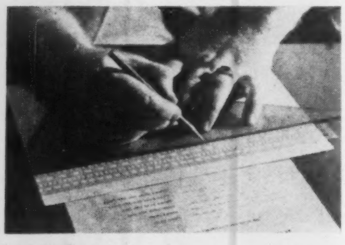
single- and double-pole, single- and double-throw. Mounting arrangements provided for auxiliary SPDT contacts if desired. Cited applications: motor control circuits; as starter for fractional hp motors; operation of signalling devices; as relay in circuits controlled by thermostats, pressure switches, float switches.

COMFORT
CONTROL by
Econo
ZONE-A-TROL

Control Valves . . .

. . .for installation, control of multiple zones on hot water heating systems—*Econo Products Co., Dept. HPAC, East Haddam, Conn.*

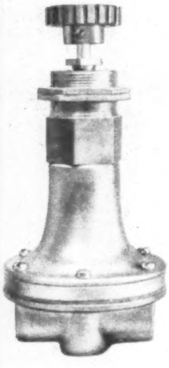
Electrically operated automatic "Zone-A-trol" unit is said to provide low cost method of installing efficient zone controlling heating on any new or existing forced hot water heating system. Unit consists of control valve operated by low voltage electric motor. Available in $\frac{3}{4}$, 1, $1\frac{1}{4}$ in. sizes for copper tubing or steel pipe.



Template . . .

. . .designed to enable draftsman to draw dot and dash lines with rapid stroke of pencil or ball-point pen—*dot-N-dasher, Dept. HPAC, Box 668, Cresskill, N.J.*

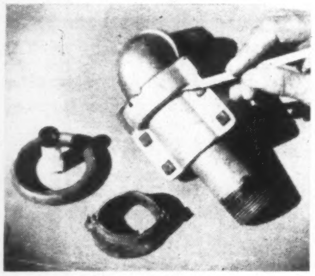
Will produce six different broken line combinations. Used by placing straight edge on desired stencil and quickly drawing line. Template made of transparent plastic.



Vacuum Regulator . . .

. . .for general laboratory use—*Conoflow Corp., Dept. HPAC,* 2100 *Arch St., Philadelphia* 3.

"Model VH-20" is said to afford very accurate control of vacuum in low capacity systems; capable of holding vacuum to as low as 1 in. ±0.05 in. mercury, says company. Available in $\frac{1}{4}$ in. size. Of forged brass and stainless steel construction.



Flanged Clamp . . .

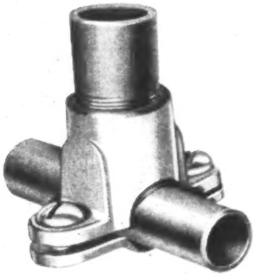
. . .with neoprene rubber ring seal designed to stop leaks at pipe joints—*Burlis Products Co., Dept. HPAC,* 1619 *Bergen St., Brooklyn* 13.

Has expanded, extended top end which fits over flange of fitting. Hollow space below expanded end holds rubber ring which is compressed into threads and leaks. Clamps made of cast aluminum in five sizes $\frac{3}{4}$ to 2 in. to fit standard malleable fittings, wrought and steel pipe, 85 percent copper pipe, screwed brass fittings.

Insulation Jacketing . . .

. . .with kraft moisture barrier bonded to entire surface of aluminum with polyethylene—*Aljon Mfg. Co., Inc., Dept. HPAC,* 58-14 *43rd St., Maspeth, N.Y.*

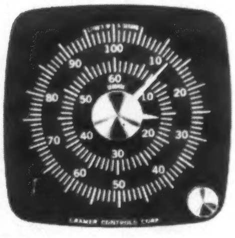
Product is said to be lightweight, very ductile, easy to handle, easy to install. Recommended by company to eliminate maintenance, cut costs on indoor and outdoor insulated pipe lines.



Brass Saddle Tee . . .

. . .engineered for quick connections on $\frac{5}{8}$ in. OD copper tubing to provide $\frac{1}{2}$ in. FPT outlet—*Sall Bros. Co., Dept. HPAC,* 2320 *Kishwaukee St., Rockford, Ill.*

"Model 25C" is heavy brass casting machined to saddle $\frac{5}{8}$ in. OD copper tubing or pipe and is attached with plated steel clamp bracket. Two parts held in place by plated steel screws. Neoprene washer between casing and tubing provides leakproof seal impervious to most liquids, gases, says company.



Electrical Stop Clock . . .

. . .engineered for instantaneous electrical reset, accuracy of 0.02 of 1 percent—*Cramer Controls Corp., Dept. HPAC, Centerbrook, Conn.*

"Type 691" in "dust-tight" commercial, military models. Available

Random Thoughts from a Filter Engineer

by *Richard E. Brown*

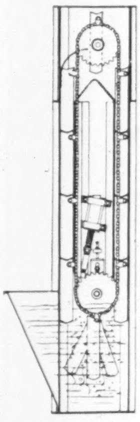
- **PROGRESS—DO SOME ENGINEERS REALLY WANT IT?**
- **ABOUT "HIGH-VELOCITY" FILTERS**
- **ABOUT DRY WASHABLE FILTERS**

PROGRESS—DO SOME ENGINEERS REALLY WANT IT?

We engineers like to feel that we never lose sight of certain basic concepts of our profession . . . "Do the most with the least," for instance. Yet, how often we hear reactions like these from other engineers: "This filter isn't like so-and-so's", or, "This filter doesn't weigh as much as this other filter" . . . and on and on.

Making a filter simpler, yet more dependable . . . smaller, yet more efficient . . . lighter, yet more rugged . . . these are things we strive for day after day in developing better filters for air conditioning and ventilating systems.

Our Electromaze electronic, to illustrate, uses single voltage and selenium rectifiers, instead of conventional dual voltage and vacuum tube rectifiers . . . yet is equal or better in performance. One model Automaze self-cleaning curtain filter uses an air cylinder instead of conventional electric drive . . . provides unique "pulse-action" that's highly effective in self-cleaning. Our P-70 dry, washable panel has corrugated media and gives over 8 times the dirt-collecting surface area of most filters of this type.



Automaze

At Air-Maze our first objective in engineering any new product is to make it "do the most". . . remove and hold the most airborne dirt while maintaining low pressure drop. But design work doesn't stop until we do the job "with the least". . . eliminate every inch, pound and detail that does not contribute to the filter's efficiency or life.

Even these advances have to be sold, and resold, to overcome the tradition of some engineers. Many engineers, fortunately, respond enthusiastically to worthwhile changes in filter design, especially when they come from a reliable manufacturer like Air-Maze.

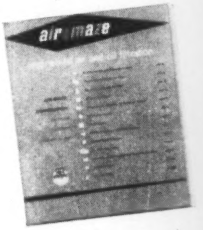
ABOUT "HIGH-VELOCITY" FILTERS

Actually the term "high-velocity" is a relative one in the air conditioning and ventilating field, and refers generally to air speeds 400 to 600 feet per minute net face velocity at the filter panel. "Normal" velocities, by comparison, are approximately 350 feet per minute.

Any filter can be used at higher-than-rated velocities . . . if its performances can be disregarded. To perform an effective service, however, a true high velocity filter should at least duplicate the dirt-removing efficiencies, the low static pressure drops, and the dirt-holding capacities of normal velocity filters.

The Air-Maze P-5 panel is a true high velocity filter. It handles 50% more air . . . up to 3 cfm per square inch of gross filter area . . . without compromise in resistance to air flow, without loss in filtering efficiency or dirt-holding capacity. Here's why:

In conventional "high-velocity" filters, air streams pass through large channels with changes in direction to impinge the dirt on adhesive. In the P-5 filter, the air stream turbulates over and under crimped wire screen channels which are multiple labyrinthian passages. This creates exceptionally high turbulence in air flow to deposit the dirt more evenly through the media rather than at the face, to give more dirt-holding capacity with lower pressure drop.



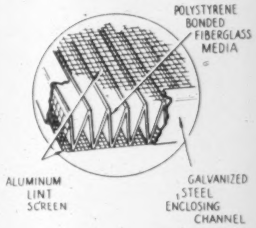
NEW ALL-LINE FILTER CATALOG

For air conditioning and ventilating equipment, engines, compressors—or any device using air or liquids—there is an Air-Maze filter engineered to solve your problem. For condensed catalog, write Air-Maze Corp., Cleveland 28, Ohio.

ABOUT DRY WASHABLE FILTERS

There are a number of "dry washable filters" on the market. Practically every one, however, is a viscous impingement filter, simply used without oil. In such designs, there are two fundamental faults. First of all, dry washable filters depend upon surface loading to remove dirt. They provide only about 2¼ square feet per 20" x 20" panel. Second, these filters unfortunately have insufficient density for good efficiency with such small surface area.

The Air-Maze P-70 filter overcomes these objections. A 20" x 20" panel actually has over 20 square feet of dirt-collecting surfaces. Specially designed corrugated media provides over *8 times* as much surface area as conventional filter media. The larger area permits efficient filtering without undue restrictions in air flow.


POLYSTYRENE BONDED FIBERGLASS MEDIA
ALUMINUM LINT SCREEN
GALVANIZED STEEL ENCLOSING CHANNEL

Principally used for removing lint and so-called nuisance dirt, the P-70 has an inert, washable media encased in a corrosion-resistant frame. It can be washed in cold or warm water and, with reasonable care, will withstand a great many washings.

The P-70 design appears to be the ideal compromise between the less effective disposable filter and the expensive replaceable dry media type. In most cases, the P-70 will pay for itself in less than a year. For more data, ask for Bulletin P70P.

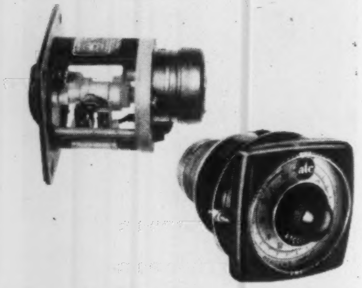
AFI MEMBER AIR FILTER INSTITUTE

AIR-MAZE

The Filter Engineers

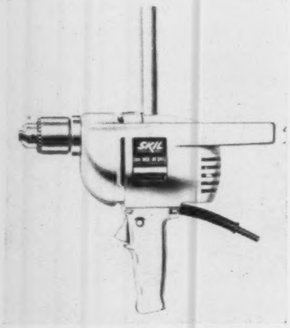
AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

for either local or remote reset. Where local reset is desired, pushbutton is provided on bezel. On sealed timer, pushbutton actuates reset solenoid through a bellows. Ratings include all standard voltages at 50 and 60 cycles, 115 volts 400 cycles (with d-c clutch) and various d-c voltages, says company.



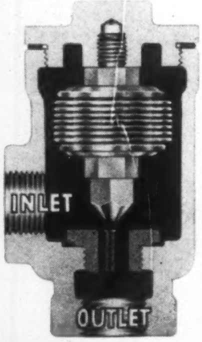
Input Controller . . .
. . . designed for dryers, evaporators, dehumidifiers, ovens, etc., requiring accuracy and control of operating temperatures—*Automatic Temperature Control Co., Inc., Dept. HPAC, 5200 Pulaski Ave., Philadelphia* 44.

"J-4A" unit controls temperatures by interrupting heating circuit at regular intervals, adjustable on dial calibrated zero to 100 percent "On-Time" per 60 sec basic cycle. Equipped with synchronous motors rated for operation 115 or 230 volts, 25, 50 or 60 cycles.



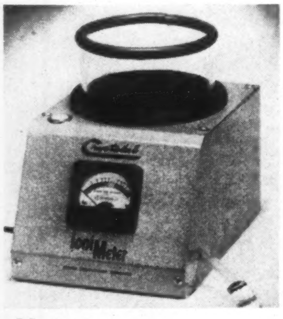
½ In. Drill . . .
. . . with detachable rear handle for use in cramped spaces—*Skil Corp., Dept. HPAC, 5033 Elston Ave., Chicago* 30.

Control maintained in pipe handle, which also may be removed for drilling closer to edges of sided enclosures, says company.



Steam Traps . . .
. . . engineered to operate on temperature differential principle—*Clark Mfg. Co., Dept. HPAC,* 180 *E. 38th St., Cleveland* 14.

Of cast semi-steel construction, thermostatic units designed for installation requiring frequent shutdowns and startups, elimination of large amounts of air or maximum protection against freezeup. With bronze or monel bellows, vertical outlets. For steam pressures to 250 psi, temperatures to 450 F. Inlet, outlet connections are ½, ¾ in.

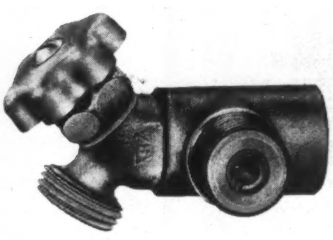


Ion Meter . . .
. . . for determining quality of water used in laboratories, production practices—*Crystal Research Laboratories, Inc., Dept. HPAC,* 29 *Allyn St., Hartford* 4, *Conn.*

"Ionimeter" equipped with D'Arsonval meter with direct reading dial graduated zero to 50 in parts per million as NaCl. Scale converted into electrical resistance is 5 million to zero ohms.

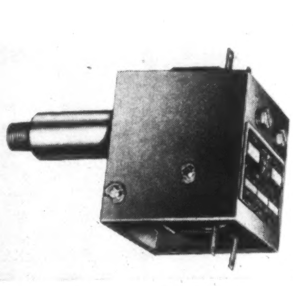
Concrete Fastener . . .
. . . with "self-drilling" feature—*Phillips Drill Co., Dept. HPAC, Michigan City, Ind.*

"Red Head" has serrated cutting teeth at one end, threaded socket at other. Circular cutting grooves of unit act as broach which undercuts hole, and four vertical milled slots assure uniform expansion, says company. Manufacturer claims they cannot pull out, rust out, melt out, shake loose. Sizes range ¼ to ⅞ in.



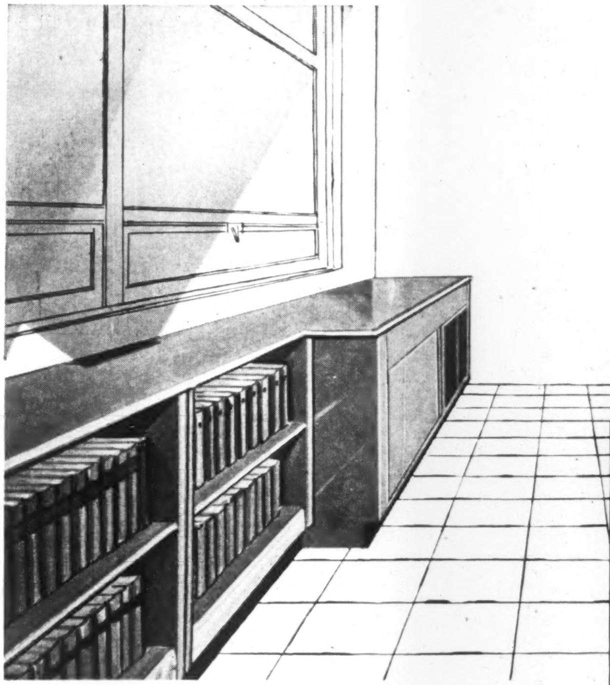
Flow Control . . .
. . . device designed to eliminate cold water turbulence in gas water heater tanks—*Ruud Mfg. Co., Dept. HPAC, Kalamazoo, Mich.*

"Flow Controlling T" is added feature to company's standard "Sanimaster" gas water heater equipment for food service industry. Is said to eliminate need for check valve in return line. Basically, device is special drain cock with additional side opening. Within cavity is orifice that controls volume and speed of water returning to "Sanimaster" when it is connected to flow and return lines of commercial washers.



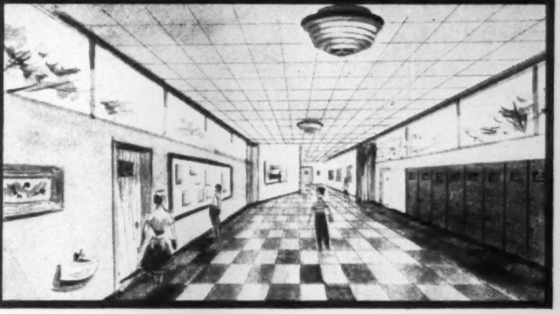
Temperature Control . . .
. . . for high limit safety—*United Electric Controls Co., Dept. HPAC,* 79 *School Street, Watertown* 72, *Mass.*

May be used wherever it is desirable to incorporate a completely



Norman Three Sixty®

INSTALLED IN SCHOOL CORRIDOR



ECONOMICAL COMFORT SPECIFICALLY DESIGNED FOR MODERN SCHOOLS

Norman Gas-Fired Forced Air Schoolroom Heating and Ventilating System

If you're planning a new school or adding rooms to an old one, be sure to check into the advantages of the Norman Schoolroom System — quality engineered after years of research and study in school heating and ventilating requirements. Outside air only is used for combustion.

IN NEW SCHOOLS—the Norman Schoolroom System eliminates the need for extra space or a separate building to house a central heating plant. No interconnecting supply or return mains are needed.

FOR ADDITIONS—simply add a Norman Classroom Package for each new classroom. It has everything needed for healthful, economical and fully automatic heating and ventilating.

NORMAN OVERHEAD HEATING FOR SCHOOL CORRIDORS, CAFETERIAS

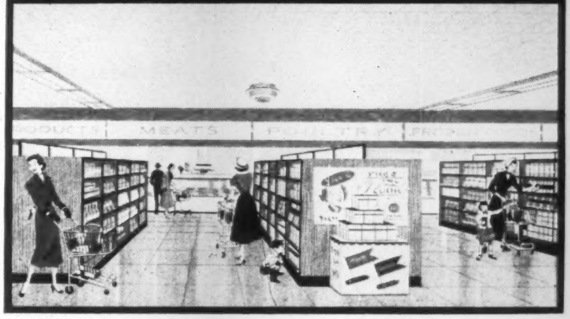
Norman Three-Sixty Forced Convection Overhead Gas Heater with

- Sealed Combustion System
- Exclusive Electric Ignition
- Forced Exhaust
- 100% Outside Air For Combustion

The beautiful new Norman circular design gas-fired overhead unit more than meets all requirements for heating large areas in schools . . . provides a full 360° umbrella of warmth . . . offers exclusive safety and performance features.

MODERN OVERHEAD HEATER FOR MODERN STORES

Adds a touch of luxury to the most attractive shoppe, store or super-market.



Mail the coupon now for literature and specifications on the Norman gas-fired Schoolroom System which provides efficient forced air distribution through ducts and diffusers in strong furniture metal book-shelf sections.

NORMAN PRODUCTS CO.
1156 Chesapeake Ave., Columbus 12, Ohio

Please send literature and specifications on the Norman Schoolroom System and the all-new Norman Three Sixty.

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ADDRESS ______
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Norman® **products company**

EQUIPMENT DEVELOPMENTS

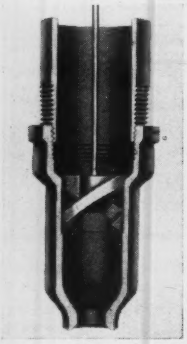
Continued

separate device in any type of equipment that requires protection against over-temperatures, says company. For 15 amperes at 115/230 volts a-c, stand-by service.

Water Vent . . .

. . . for venting convectors, baseboard and wall radiation—*Hoffman Specialty Mfg. Corp., Dept. HPAC,* 1700 *W.* 10*th St., Indianapolis* 7.

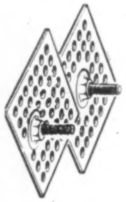
"No. 790" is said to assure positive venting, continuous removal of air from system. Top has drain tubing to conduct away moist air. Size connection: ⅛ in. Maximum operating pressure: 30 psi.



Nozzle . . .

. . . with "pull-out-vane" feature—*Spraying Systems Co., Dept. HPAC,* 3219 *Randolph St., Bellwood, Ill.*

Designed to simplify cleaning when nozzles are mounted in inaccessible places. Vane made with small female threaded connection to receive pull-out rod, to be installed by user at whatever length required. When cleaning is needed, vane is drawn back through pipe, removed and cleaned while nozzle is flushed out. Available in range of sizes, capacities.



Anchor Device . . .

. . . with "Offset Insert-Base" feature—*Stic-Klip Mfg. Co., Inc., Dept. HPAC,* 500 *Regent St., Cambridge* 40, *Mass.*

With cup screws or captive nuts, units available for wall attachments where drilling or pentrating wall surface is undesireable.

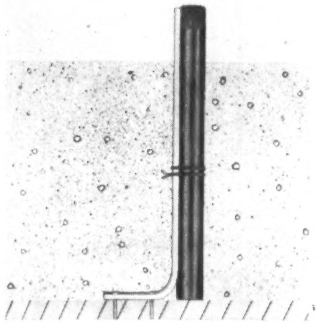
Pressure Transmitter . . .

. . . for pneumatic transmission of process pressure measurements—*Foxboro Co., Dept. HPAC, Foxboro, Mass.*

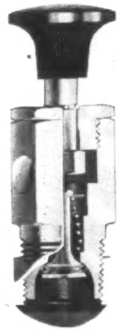
"Model 44" is said to be accurate to ±1 percent of scale range. Measures pressure 0-30 in. water to 0-6000 psi, transmitting 3-15 psi air signal to indicating, recording or controlling instruments. Choice of pressure elements offered.

Steel Channel Stakes . . .

. . . designed to provide quick, easy, efficient method of supporting pipes, conduit, tubing, cable in exact locations during concrete pouring of floors, walls—*Industrial Sheet Metal Work, Dept. HPAC,* 3155 *N. Halsted St., Chicago* 14.



Is made of 16 gage steel, ½ in. wide and stands 12 inches. Right angle support piece contains two holes for nails. In use, pipe to be supported is set in position, channel stake placed upright against pipe and secured to deck, and pipe tied with wire to stake. Thus, when concrete is poured, pipe will remain in position, says company.



Valves . . .

. . . for tank or fluid systems—*Circle Seal Products Co., Inc., Dept. HPAC,* 2181 *E. Foothill Blvd., Pasadena, Calif.*

Designed to serve dual function of breaking vacuum automatically in draining, bleeding air displaced in filling. Normally, valve seals dead tight preventing loss of system pressure. When fluid is being withdrawn from system or temperature drops, valve opens automatically to break vacuum and permit free flow. Made of lightweight aluminum, is available in ½, ¾ in. pipe sizes.

Hook Gage . . .

. . . designed to simplify critical low pressure and vacuum measurements

Activated Charcoal Air Purification Makes Possible 100% Recirculation of Inside Air

Architects & Engrs.
KISTNER, WRITH & WRIGHT

Genrl. Contr.
MYERS BROS.

Air Cond. Contr.
AIR COMFORT CO.

Barnebey-Cheney
Representatives
COOLING & HEATING ENGINEERS

All of Los Angeles

The new office building of the California Teachers' Association, in Los Angeles, boasts an air conditioning system virtually independent of outside air. All outside air intake is eliminated and inside air recirculated 100% through Activated Charcoal air purifying cells. Original design of the system called for 28% outside air, but after charcoal was decided on outside air design was reduced to 5%. In actual operation, outside air is reduced to zero and recirculation is 100%. The charcoal air purifiers remove odors common to occupied office space and eliminate smog which infiltrates. The 64 Activated Charcoal air purifying cells handle a total of 58,000 c.f.m. Employees of the association enjoy pure, clean air during working hours — in a city noted for atmospheric pollution.

TOTAL RECIRCULATION CUTS HEATING/COOLING LOAD

Even without the smog threat, total recirculation through Activated Charcoal air purifiers makes good sense. Up to 30% savings can be made by eliminating the need to continually heat or cool outside air. "Ventilation" is accomplished by the Activated Charcoal purification.

Activated charcoal FilterFold, of the type used in the Calif. Teachers' Ass'n. building, above.

BARNEBEY-CHENEY

NORTH CASSADY AT EIGHTH **COLUMBUS 19, OHIO**

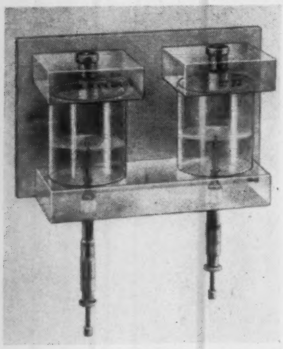
Please send technical information on air purification with Activated Charcoal HP5

My Name . . . .

Firm . . . .

Address . . . .

City . . . . **State** . . . .



—F. W. Dwyer Mfg. Co., Dept. HPAC, P. O. Box 373, Michigan City, Ind.

For all applications except fluctuating pressures, is especially valuable in checking and adjusting delicate instruments used for measuring air flow, making precise laboratory draft tests, says company. Consists of two water columns, each equipped with stainless steel hook controlled by depth micrometer. Difference between column heights indicates pressure differential in inches of water.

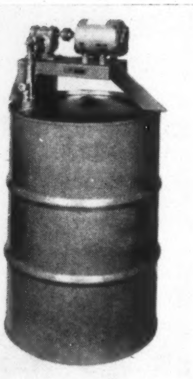
Glass Fiber Filter . . .

. . . for room air conditioners—*Owens-Corning Fiberglas Corp., Dept. HPAC,* 1911 *Nicholas Bldg., Toledo* 1.

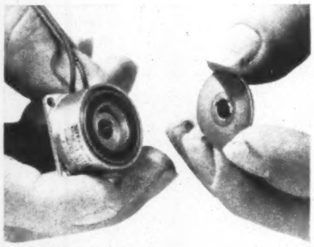
"U-Trim-It" fitted by using old filter as pattern, trimming off excess, slipping into place in air conditioner. Glass fibers produced at density said to provide stability without use of frame or grille, says company.

Controlled Volume Pump . .

. . . for barrel head mounting—*Milton Roy Co., Dept. HPAC,* 1300 *E. Mermaid Ln., Philadelphia* 18.



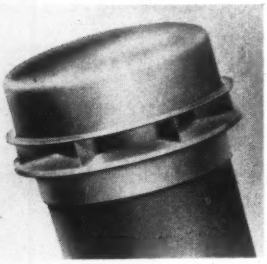
Designed to meter toxic or corrosive chemicals from upright, 55 gal barrels against pressure to 100 psi. Available in maximum capacities 500 ml per hr to 4 gph. With constant speed, 1/3 hp, 115 volt, 60 cycle motors.



Miniature Clutch . . .

. . . designed for use on low torque drive of instruments, miniaturized control mechanisms—*Warner Electric Brake & Clutch Co., Dept. HPAC, Beloit, Wis.*

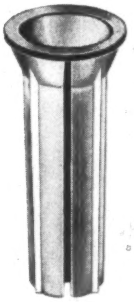
Electromagnetically operated "SF-100" is said to give instantaneous, positive engagement, release of loads to 2 lb in. (static torque rating).



Draft Cap . . .

. . . line increased to include sizes 3 to 7 in.—*Tesco, Inc., Dept. HPAC,* 1403 *E. Fifth Court, Tulsa* 20.

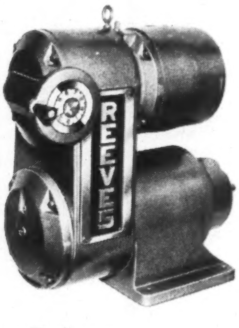
Cap features pressure balancing principle which prevents excess stack loss due to winds, says company. Manufacturer has renamed product from "Blu-Blaze" to "Flu-Bonnet."



Lead Screw Anchor . . .

. . . designed to provide increased holding power—*Rawlplug Co., Dept. HPAC,* 212 *Petersville Rd., New Rochelle, N.Y.*

Top flare-out speeds up anchoring time because screws can be inserted quickly, says company. For sheet metal or wood screws.



Motor Drives . . .

. . . engineered for improved operating efficiency, extended ratios of speed variation—*Reliance Electric and Engineering Co., Dept. HPAC,* 24701 *Euclid Ave., Cleveland* 17.

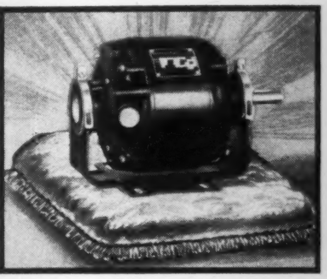
Each size of "Reeves Vari-Speed Motodrive" available in standard assemblies tailored to fit wide range of space requirements, says company. In integral horsepower ratings to 5 hp.

Wrench Booster . . .

. . . engineered to increase wrench turning force four times—*X-4 Corp., Dept. HPAC, Acton, Mass.*

tailor-made for You

. . . and
every
one
a
perfect
fit



No Sir, no ready-made here. Emerson-Electric motors are custom-engineered for your product . . . *designed* for you, *produced* for you and *priced* for you. It is no longer necessary to design your product around a *standard* motor. Emerson-Electric engineers will work with you through every stage of development. You get the product you want with a motor that EXACTLY suits your purposes . . . a custom-engineered motor at *standard motor prices.* Call, wire or write Dept. M-52 today, The Emerson Electric Mfg. Co., St. Louis 21, Mo.

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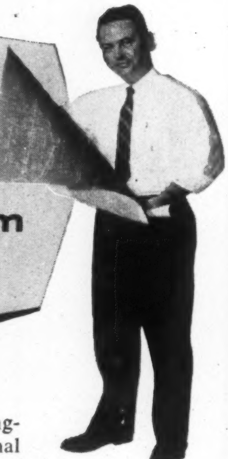


"Reznor sectional duct furnaces let us design the ideal heating-cooling system for each job"

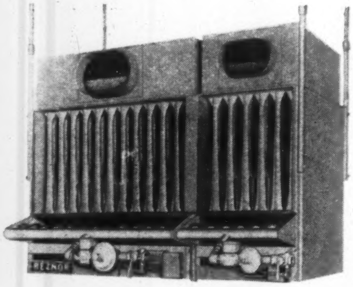
"We'd never been able to design a really ideal heating-cooling system until Reznor introduced their sectional duct furnace. And even if we had designed one, installation problems would have been stymied until the Reznor sectional duct furnace came along.

"Sectional assembly eliminates the installation problems which formerly prevented the use of large capacity custom-engineered duct systems. With the new Reznor DS sectional duct furnaces, we can specify system capacities of two million BTU or more knowing that they can be assembled on the job from sections weighing no more than 315 pounds.

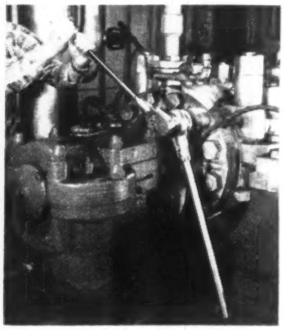
"Reznor sectional duct furnaces free us completely from packaged heating equipment which isn't exactly right for any one job because it has to be almost right for so many jobs. Now we start with a Reznor duct furnace, which is simply nothing more than a compact, highly efficient gas-fired heat exchanger with a complete set of combustion controls. To this we add the components for air moving, cooling, cleaning, and humidifying selected to meet exact job requirements. For our client it means greater efficiency, greater comfort, and lower cost.

"Reznor sectional duct furnaces are a heating engineer's dream come true . . . and our long experience with Reznor gas unit heaters gives us complete assurance that these new duct furnaces will be tops in efficient performance, dependable service and long life, too."

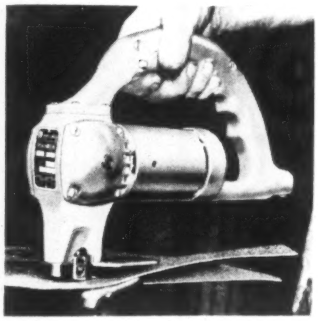
If you're not taking advantage of the design freedom these new units offer you, you're really missing something. Write today for free catalog or call your nearby Reznor distributor for details. You'll find him listed under "Heaters-Unit" in the yellow pages of your telephone directory.



REZNOR
THE WORLD'S LARGEST-SELLING
GAS UNIT HEATERS
REZNOR MANUFACTURING COMPANY
51 Union Street, Mercer, Pa.



Allows one man to do work of four in loosening or tightening high torque, threaded parts. Heart of unit is set of planetary gears built into concentric tool head. Can be quickly dismantled for cleaning or lubrication, says company. For torques to 2000 ft lb.



Shear . . .

. . .engineered to make fast, easy cuts in all types of sheet metal—*Black & Decker Mfg. Co., Dept. HPAC, 628 Pennsylvania Ave., Towson 4, Md.*

"No. 16" powered by motor with armature designed for long, heavy impact service, says company. Unit is said to cut through cold rolled steel at speeds to 30 fpm. With one-piece shoe contoured to indicate correct cutting angle, and constructed to permit cutting to small radius.

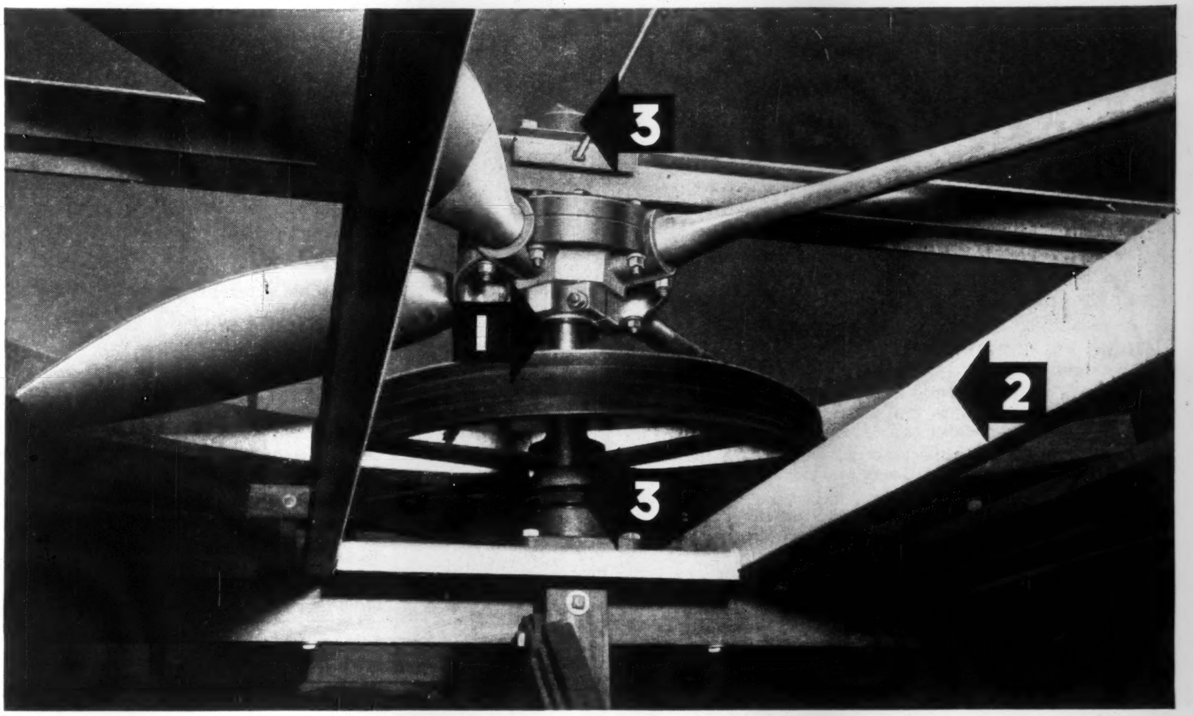
Interval Timer . . .

. . .with design, operational innovations—*Cramer Controls Corp., Dept. HPAC, Centerbrook, Conn.*

For built-in applications, "Type 271" can be two-hole mounted or one-hole center mounted. "Bakelite"

THE Pritchard LoLine®

HAS MECHANICAL FEATURES THAT ADD UP TO LONGER LIFE, TROUBLE-FREE OPERATION



TEFC MOTORS . . . totally enclosed, fan cooled motors are standard equipment on both Series "B" (8′ high) and Series "R" (12′ high) LoLine towers. They require no additional enclosure or protection against weather.

❶ STAINLESS STEEL FAN SHAFT . . . on multi V-belt drive, eliminates costly corrosion problems and hazards of fan shaft breakage.

❷ HOT-DIP GALVANIZING . . . all steel parts are hot-dip galvanized after fabrication. The one proven method to successfully stop rust and corrosion.

❸ OVERSIZED BEARINGS . . . factory sealed and widely separated to reduce bearing load. Bearings on multi V-belt drive have grease fittings brought to outside of fan ring for easy, safe lubrication.

SPEED REDUCER DRIVE (Standard on Series "R")...uses spiral bevel gear rated by AGMA methods and built specifically for cooling tower service, assuring adequate size for duty.

DRIVE SHAFT FOR REDUCER (Standard on Series "R") . . . is full floating, non-lubricated with stainless steel, flexible discs for longer life. All of these mechanical features found in the LoLine cooling tower add up to maximum performance and years of trouble-free service.

Whether It's for Air Conditioning Use or Industrial Service You Get More for Your Cooling Tower Dollar with a Pritchard LoLine

ALL THE FACTS AT YOUR FINGERTIPS

Get all the facts on the outstanding Pritchard LoLine Cooling Towers . . . including complete engineering data . . . by writing today on your company letterhead for the new, LoLine Bulletin (No. 5.1.902). This unique brochure gives you all the information you will want in one convenient source. Write for your FREE copy today!

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GAS & AIR TREATING EQUIPMENT

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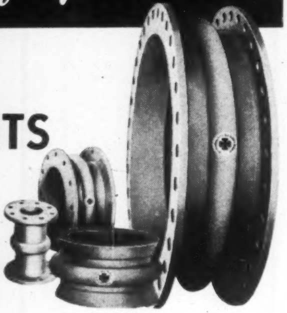
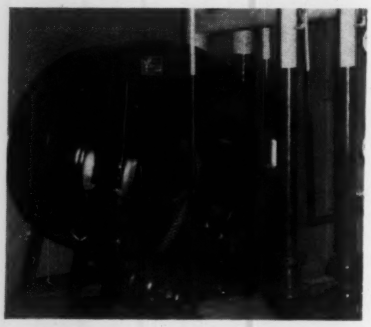
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 590 4625 Roanoke Parkway, Kansas City 12, Mo.





The Economical Answer to
RELIABLE PROTECTION
for Piping and Equipment

GOODALL *Rubber*
EXPANSION JOINTS

Custom-built to meet specific requirements in sizes from ⅜″ I.D. to 96″ I.D., for pressures up to 125 lbs. P.S.I. and/or vacuum. They are available in Right Angle and Sleeve Types, as well as "Flang-Lok"; single or multiple arch; tapered; offset; and rectangular.

LONGER SERVICE LIFE. No deterioration through embrittlement or corrosion.

SENSITIVE RESPONSE TO PRESSURE. Only slightest pressure required to create movement in the joint, in any direction. Stress on metal pipe or other connected member reduced to absolute minimum.

EASIER TO INSTALL. Light in weight . . . short face-to-face dimensions . . . retaining rings or flanges quickly aligned and bolted. No gaskets required.

"FLANG-LOK". A patented Goodall development which provides exceptional ease of installation; greater sealing face area; and a completely non-metallic seal.

"Rubberhide"
CORROSION-RESISTANT
LININGS

If you have a corrosion problem, you can rely on Goodall engineering experience and technical skill for "RUBBERHIDE" Linings compounded to assure long-lasting protection against the particular corrosive agents involved. They will repay many times their cost through extended life of products, parts or equipment.

Produced with either rubber or neoprene as the base material. Processed to objects shipped to our Linings Plants in Trenton, Chicago or Houston; or, when the objects are too large for such shipment, or the work involves fixed plant equipment, experienced field crews do the processing "on location".

★ ★ ★

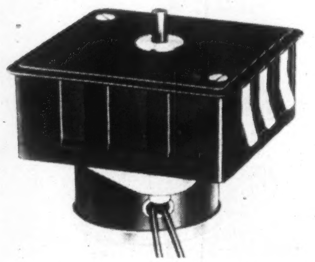
"Long-Life" PLASTIC PIPE Flexible, Semi-Rigid and Rigid types, manufactured under exacting quality control to assure absolute uniformity in characteristics and dimensions.

"If it's GOODALL, it MUST be Good!"
Contact Our Nearest Branch for Details and Prices

Standard of Quality—Since 1870
HOSE · BELTING · FOOTWEAR · CLOTHING
AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.
Branches and Distributors Throughout the United States and in Canada



case houses one or two SPDT or SPST open blade switches rated 30 amps, 115 volts a-c resistive and 1/3 hp at 115 volts a-c. Permanent magnet synchronous motor drives cams which actuate 30 amp switches at full scale intervals ranging 45 sec to 6 days, says company.

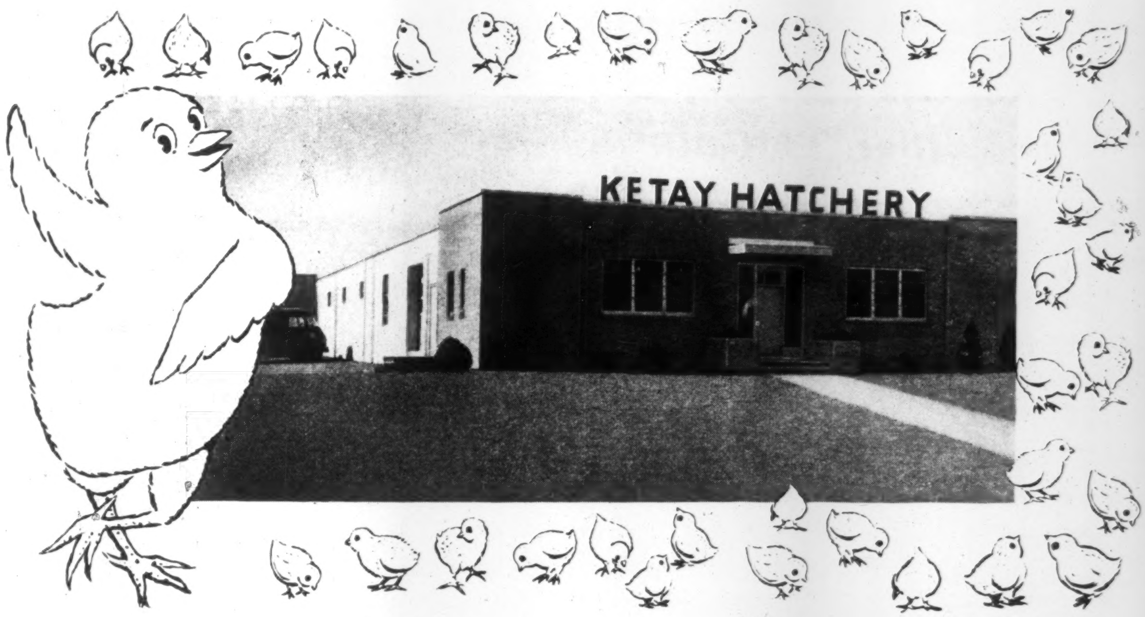
Tapering Tool . . .

. . .designed to put taper on bituminous fiber pipe—*Talon Tools, Inc., Dept. HPAC, North Arlington, N.J.*

Makes possible for contractor to use leftover short lengths of fiber pipe which would otherwise be thrown away as waste, says company. Said to be very fast cutting, puts 2 deg taper on squarely cut fiber pipe in less than 30 sec. In two sizes for tapering 3 and 4 in. pipe. Also in power model for use with ½ in. electric drill.

Equipment Brief . . .

FUSE PULLER PANEL for service entrance applications requiring capacity in excess of 100 amperes—*Circuit Protective Devices Dept., General Electric Co., Dept. HPAC, Plainville, Conn.* Available with 12 or 16 plug-fuse branch circuits. With four fuse pullers. ⌗



Millions of chicks can't be wrong about

AMERICAN-Standard

A-7 cast iron boiler for use with all fuels

- Heavy-duty cast iron sections — factory-tested at 2½ times normal operating pressure
- New upward and outward design of waterways plus high water level assures maximum internal circulation
- 866 Mbh to 2454 Mbh gross I=B=R output
- Eight practical sizes — 5 to 12 cast iron sections
- Compact design permits easy handling
- Rear sections tapped for external-type water heater
- Exclusive, new, steel pedestal base eliminates costly floor pitting, special fire brick base construction

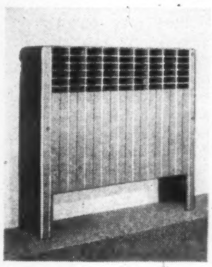
SEE YOUR LOCAL American-Standard representative for more information. AMERICAN STANDARD, PLUMBING & HEATING DIV., 40 W. 40th St., New York 18, N. Y.

Modern hatchery heated by new, compact A-7 cast iron boiler by American-Standard

The new, modern Ketay Hatchery — with a production of 250,000 chicks each week — is heated by the new, modern A-7 Oil Boiler by American-Standard. This compact cast iron boiler, which occupies only 24 sq. ft. of boiler room floor space, heats an area of 12,500 sq. ft. and delivers an output of 1,202,000 Btu per hour with a firing rate of 14.65 gph.

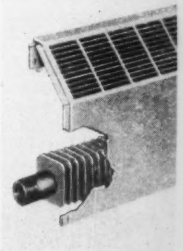
The Ketay Hatchery also features other quality American-Standard heating products — the office areas are heated by compact, attractive Temtrim Finned Tube Radiation while lavatories have modern cast iron Sunrad Radiators.

PLUMBING, HEATING, COOLING MONTH



◀ **Sunrad Radiator** — cast iron construction — compact recessed or free-standing models — provides high heat output. Two convenient depths and heights — 5″ and 7½″ deep, 20″ and 23″ high.

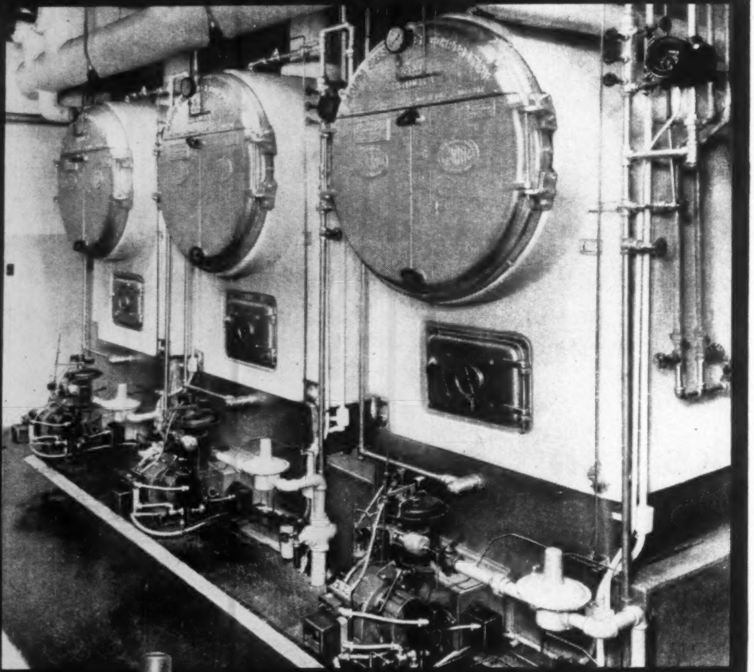
Temtrim Finned Tube Radiation — Assures maximum economy — installed exposed or choice of three smart covers (sloping top enclosure shown). ▶

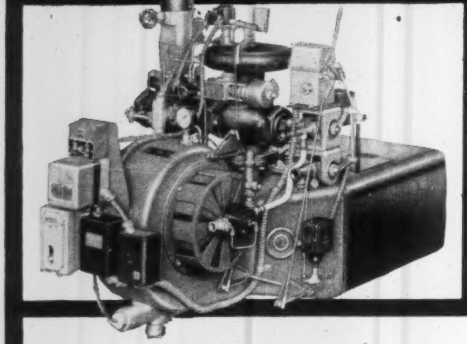


AMERICAN-Standard

PLUMBING AND HEATING DIVISION

Reports 33% fuel saving from Mettler "FAN-AIR" burners





Why consulting engineers specify Mettler Burners

Change fuels easily, with remote, manual, or automatic control . . . lifetime integrated multi-port combustion tile provides complete, efficient fuel burning . . . exchange of gas orifices gives wide capacity range . . . exclusive pilot rectification control system assures safer combustion . . . give flexible operation with mechanical or natural draft.

Conversion of three boilers using "FAN-AIR" Dual Fuel Burners produced a sizeable three-way saving! In addition to 33% reduction in gas consumption, boiler maintenance has been reduced greatly because complete combustion keeps the fire-tubes clean. The boiler room is cleaner, too, and firebrick spalling and cracking has been eliminated. Modulating fuel control minimizes temperature fluctuations and adds years of life to the furnaces. These are results you can expect from "FAN-AIR" Dual Fuel Burners . . . results that win customers and influence sales *for you*. Range of sizes from 25 to 500 horsepower, for any grade of gas or oil fuel. Write for specifications and descriptive Bulletin No. 12-S.

METTLER

Eclipse

THE METTLER CO., INC.

Division of ECLIPSE FUEL ENGINEERING CO.

4366 Worth Street, Los Angeles 63, Cal.

RECENT TRADE LITERATURE . . .

▶ *ADHESIVES, COATINGS, SEALERS*—Industrial materials selection chart lists application and descriptive information, including data on adhesives, coatings, sealers. *Miracle Adhesives Corp., Dept. HPAC, P.O. Box 466, New Philadelphia, Ohio.*

▶ *AIR CONDITIONERS*—Four page folder illustrates, describes air conditioning units in 2, 3, 5, 10 ton capacity models. Highlights "Genatron" heat pump, available on all units in line except one. *General Air Conditioning Corp., Dept. HPAC, 4542 E. Dunham St., Los Angeles 23.*

▶ *AIR CONDITIONERS*—"Roomaire" conditioners for motels, offices, apartments, schools, hotels, hospitals, public buildings presented in form No. 7957. Cutaway illustration shows component parts. *Young Radiator Co., Dept. HPAC, Racine, Wis.*

▶ *AIR FILTRATION*—Bulletin 120 shows comparable efficiences of various types of filters, defines "high efficiency" filtration, gives basic information on filter selection. Discusses interchangeable-cartridge arrangement of company's "Aerosolve" units. *Cambridge Filter Corp., Dept. HPAC, 738 E. Erie Blvd., Syracuse.*

▶ *ALLOYS, FLUXES*—Data folder designed to aid buyers of specialty alloys and fluxes in making correct choices for their particular applications. Covering company's complete line, folder contains purchasing information in condensed reference form. *All-State Welding Alloys Co., Inc., Dept. HPAC, 249-55 Ferris Ave., White Plains, N.Y.*

▶ *CENTRAL CONTROL SYSTEMS*—New 20 page brochure illustrates, describes central control systems for automatic control of on-off functions

Mark of Integrity

...in reporting circulation facts

We display the Audit Bureau of Circulations* symbol with pride! It's our mark of circulation integrity!

The seasoned marketing man finds trustworthy data vital in his work of advertising media evaluation. And *reliable net paid circulation figures* are among the most valuable facts he uses in selecting printed media for his advertising campaigns.

Once every advertiser guessed about circulation accuracy and gambled on advertising results; today he need not question the wealth of data in any A.B.C. audit report, for it contains only *verified* answers to his most searching circulation queries.

* * *

When a media director or advertiser asks us, "How much paid circulation? What do your readers pay? Where does your circulation go? How do you get circulation—your audience for my advertising?", we need only show him our latest A.B.C. audit report. There he finds factual answers that annually pass the test of a trained A.B.C. circulation auditor's scrutiny.

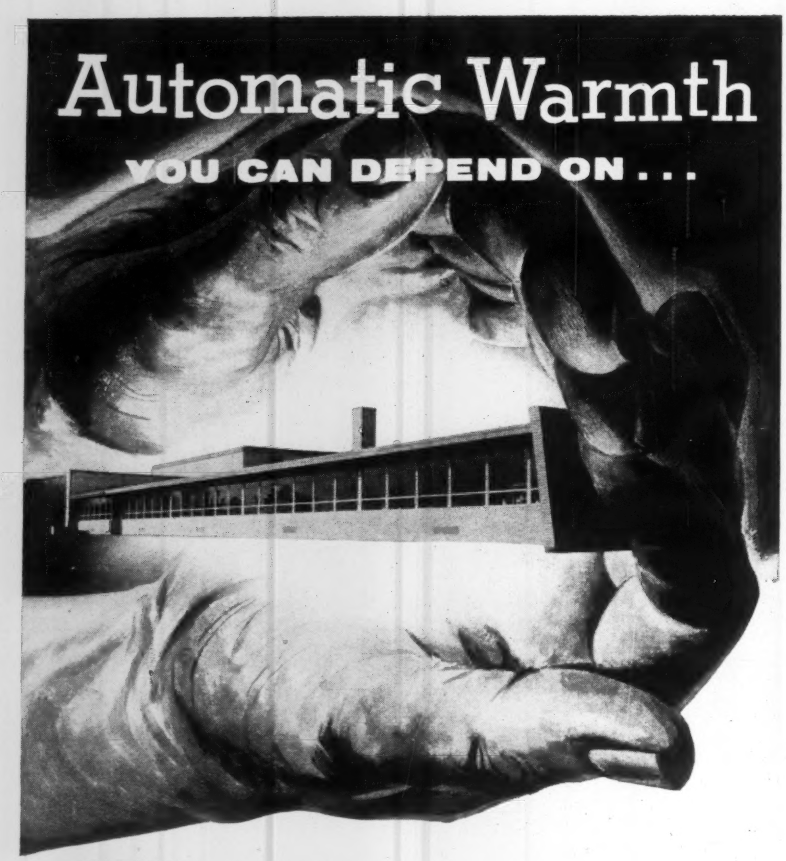
And any buyer of space can decide for himself, with confidence, the value of our circulation audience. Our A.B.C. membership means circulation reported in accordance with recognized, impartial standards, established by buyers and sellers of space working together in A.B.C.

Publishers who meet the Bureau's high standards know the A.B.C. symbol as a mark of circulation integrity. The value-wise advertiser, too, has learned that *the A.B.C. symbol is his dependable guide to the audited facts* about net paid circulation that protect his advertising investments.

*The Audit Bureau of Circulations, founded in 1914, is a cooperative, nonprofit association of the leading buyers and sellers of advertising space. A.B.C. sets standards for net paid circulation, audits and reports circulation facts. **To be sure of what your print media dollar buys—look for the A.B.C. symbol.**

Heating, Piping & Air Conditioning

MEASURE OF SERVICE... MARK OF INTEGRITY



WITH

CANTON STOKERS AND *Flo-tube*

For dependable heat and power, Canton Stokers . . . *engineered to job specifications at factory* . . . offer an exclusive combination of advantages:

80% to 90% Automatic. Coal firing with Canton wormfeed and ramfeed stokers is, to all practical purposes, automatic. Canton "Synchro" Combustion Controls automatically adjust fuel feeding, air supply, draft and combustion rates in proportion to steam demand or to water and weather temperatures.

Clean Fuel Handling. Canton Flo-tube screw conveyors deliver coal from bin or pile in dependable volume. The only hand work required is ash removal . . . greatly simplified by dumping grates and ash sprays.

Smoke Control. Canton Turbo-aire smoke control systems burn smoke in the boiler. They comply with smoke abatement regulations.

Low Fuel and Maintenance Costs. In addition to firing the lowest cost fuel automatically, Canton Stokers are built for trouble-free performance. Working parts are fully guaranteed.

For prompt attention to your heating and service requirements, write or wire . . . today.

CANTON STOKERS

CANTON STOKER CORPORATION
2400 Andrew Place, S. W., Canton 1, Ohio

N-468-CS

RECENT TRADE LITERATURE
Continued

without special control wiring. Covers use of systems for remote control of heating, air conditioning. *International Business Machines Corp., Dept. HPAC,* 590 *Madison Ave., New York* 22.

▶ *CENTRIFUGAL FAN COOLING TOWERS*—Bulletin CF-600 on centrifugal fan cooling towers describes company's standard and "Take-Apart" units. Booklet covers construction of towers, including wetted deck surface, water distribution, fans, motor, housing, drive. *Halstead & Mitchell, Dept. HPAC,* 704 *Bessemer Bldg., Pittsburgh* 22.

▶ *CLAD METALS*—Technical data bulletin No. GM-901 describes clad metals, contact materials, contact assemblies. Section devoted to "Braze-Clad," designed to speed brazing operations, cut costs. *American Silver Co., Dept. HPAC,* 36-07 *Prince St., Flushing* 54, *N.Y.*

▶ *CONTROL CENTERS*—"Electrionic" control centers, designed as new concept in automatic temperature control, described in 8 page booklet F 8031. Discusses functions, uses, advantages of centralized automatic control with visual supervision of entire heating and air conditioning system. *Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

▶ *CONTROL VALVES*—Two new specifications give details of construction for single-seated, double-seated "Series 800" diaphragm control valves. Included are sizes, materials, plug characteristic curves, dimensions, cross-sectional drawing of each type. Units designed for controlling flow of liquids, gases, steam under wide range of operating conditions. *Minneapolis-Honeywell Regulator Co., Valve Div., Dept. HPAC, Philadelphia* 23.

▶ *COOLING TOWERS*—Company's "WMT" series cooling towers cov-

Real Heating Comfort for Low, Medium or High Buildings

For the Hangar that houses the big B-52 Bombers

(It's 90 feet high and one-sixth of a mile long)

Boeing again chose "Wing Revolving" Heaters

Since their first installation in the 1940's, the Boeing Airplane Company of Seattle has installed "Wing Revolving" Heaters in many of its hangars and other manufacturing buildings. When the new Flight Test Hangar, 880 feet long by 200 feet wide and 90 feet high, was built to hold five giant B-52 Bombers at one time, "Wing Revolving" Heaters once again were selected to heat it.

Mounted high above the planes, the heaters project warm air downward from slowly revolving distributing outlets. The entire working area is covered with a blanket of warm air that moves around, over and under the widespread airplane wings.

"Wing Revolving" Heaters can be the answer to your heating problem, too, regardless of the height or area of the building. With "revolving heat" every worker is in the "comfort zone" for there are no steady hot blasts; no pockets of cold air. And, in summer, with heaters operating with steam turned off, the revolving distributors produce a pleasant cooling effect that keeps workers refreshed and more productive.

To get details send for Bulletin HR-6A.

WING
Revolving
HEATER

Four designs of revolving distributors are available. In the high hangar above, No. 10 design was used. At left is shown the No. 5 design for low buildings.

Wing
REVOLVING HEATERS

L. J. Wing Mfg. Co.

140 Vreeland Mills Rd., Linden, N. J.
Factories: Linden, N.J. and Montreal, Canada
In Europe: WANSON, Haren-Nord, Brussels, Belgium

L. J. Wing Mfg. Co. HP-5
140 Vreeland Mills Rd., Linden, N.J.

Please send me Bulletin HR-6A—Revolving Heaters

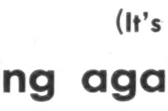
Name..

Firm..

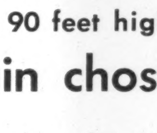
Address.......................................

City..................Zone.....State..........

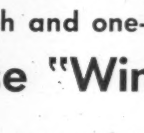
WING FRESH AIR SUPPLY HEATERS



WING DRAFT INDUCERS



WING FANS



WING TURBINES

WING MOTORIZED BLOWERS

What do you mean, "CLEAN AIR"?

Clean air is a matter of degree. Air which by some standards has been "filtered" is much too dirty for many applications. In selecting filters, one fact must be kept in mind —

Invisible, Smudge-Producing Particles GO RIGHT THROUGH Most Filters

Only a small percentage of the dust in the atmosphere is visible. Consequently, filters which are reasonably efficient on large dust particles (see ASHVE test below) are much less efficient on atmospheric dust (N.B.S. test) and practically worthless on smoke (DOP test).

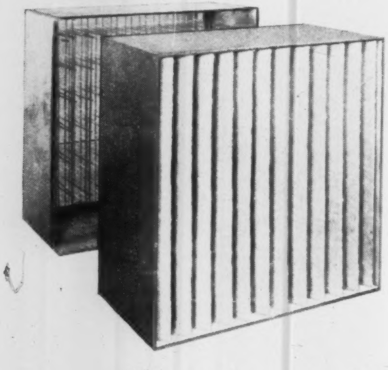
STANDARD TESTS — PERCENTAGE OF EFFICIENCY

TYPE FILTER	ASHVE (Weight Test)	NBS TEST # (Atmospheric Dust)	DOP TEST (0.3 Micron Smoke)
Cambridge Absolute	*	*	**99.95 Min.
Cambridge Aerosolve 95	*	90-95	80-85
Cambridge Aerosolve 85	99	80-85	50-60
Cambridge Aerosolve 35	96	30-35	20-30
Electronic Precipitator	99	85-90	60-70
Automatic	76	8-12	2-5
Panel	76	8-12	2-5

*Practically 100%. Test not practical for more accurate reading.

#National Bureau of Standards Discoloration Test.

**Maximum Allowable Penetration of Dioctyl Phthalate Smoke 0.05%. Every filter individually tested.



Cambridge AEROSOLVE® Filters

Available in Range to Meet YOUR High-Efficiency Needs

Cartridges Interchangeable to Meet Changes in Process or Supply-Air Conditions

The annual owning and operating costs of Cambridge Aerosolve Filters are so low that high efficiency air filtration is now practical on all process and comfort conditioning jobs. Cartridges of three available efficiencies fit the same cadmium-plated permanent frames, so that cartridges of higher or lower efficiency can be substituted without change in the filter system.

They are easy and inexpensive to install, and there is no maintenance except infrequent, easy cartridge replacement. Service life is much greater even than that of far less efficient filters.

Write for Bulletin 120

Cambridge Filter Corporation
732 E. Erie Blvd., Syracuse 3, N. Y.

Also Makers of the Famous ABSOLUTE® Filter— World's Most Efficient Air Cleaning Device

REPRESENTATIVES IN PRINCIPAL CITIES

RECENT TRADE LITERATURE

Continued

ered in 2 page bulletin C-H.5625. Literature includes table of dimensions for 13 standard models in 1500 to 24,500 cfm range. Contains diagrams of unit arrangements. *Drayer Hanson, Div. of National-U.S. Radiator Corp., Dept. HPAC,* 3301 *Medford St., Los Angeles* 63.

▶ *CORROSIVE FUME EXHAUST* —*Exhaust Fumes from Corrosive Chemicals* is title of 4 page folder dealing with problems of corrosive fumes and atmospheres. Models of air moving equipment featured in pamphlet include centrifugal and axial type plastic fans, rubber lined and coated centrifugal type steel blowers, plastic or rubber lined ejector units, coated axial fans. *Heil Process Equipment Corp., Dept. HPAC,* 12901 *Elmwood Ave., Cleveland* 11.

▶ *CORROSIVE FUME REMOVAL* —Importance, use of corrosive fume ventilation equipment described in 10 page report. Illustrates, covers recommended exhaust rates, procedures, air flow charts, types of systems, different types of fume removal equipment and their applications. *Heil Process Equipment Corp., Dept. HPAC,* 12901 *Elmwood Ave., Cleveland* 11.

▶ *DRAFT CONTROLS*—Two page circular describes new line of barometric draft controls for use with oil fired heating equipment. Visualizes design, construction features with drawings, photographs. Covers commercial, heavy duty models in 12 to 32 in. sizes. *Wm. Steinen Mfg. Co., Dept. HPAC,* 45 *Bruen St., Newark.*

▶ *DRAFT INDUCER BLOWERS*—Brochure describes several of company's blowers designed for inducing drafts in boiler installations, eliminating need for extensive chimney building. Includes information on such installations as well as data on sizes, specifications, performance.

This Weil-McLain HR-44-W10 Boiler installed in Ramapo Manor Nursing Center, Airmont, Suffern, N. Y., develops 65 H.P. Contractor states that Weil-McLain assembly methods enabled him to save 15 hours in erection time.

HEATING CONTRACTOR
Universal Plumbing & Heating Co.,
Paterson, N. J.

DISTRIBUTOR
Passaic Valley Supply Co.,
Paterson, N. J.

•

OUTSTANDING FOR ECONOMICAL OPERATION AND LONG LIFE

•

WEIL-McLAIN "HR" SERIES

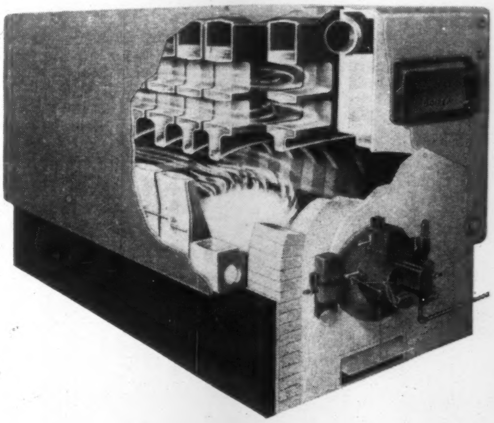
HEAVY DUTY BOILERS FOR HORIZONTAL ROTARY OIL BURNERS

Here is a cast iron boiler built to do a specific job with exceptional efficiency. The "HR" Boiler is designed *to fully develop the economies possible with rotary burners using heavy, low-cost oils!*

Note these design and construction highlights—

1. **Cast iron construction**—strongly resistant to corrosion.
2. **Extra large combustion volume**—assures lower heat release per cu. ft.—higher CO_2.
3. **Large waterways**—for rapid, efficient circulation.
4. **Special steel front plate**—simplifies installation and alignment of burner. Can be factory-drilled and tapped to specification.
5. **Short draw-rod assembly**—shortens erection time—makes a strain-free assembly.
6. **High base**—eliminates high brick foundation.
7. **Insulated jacket**—saves insulating time on the job.

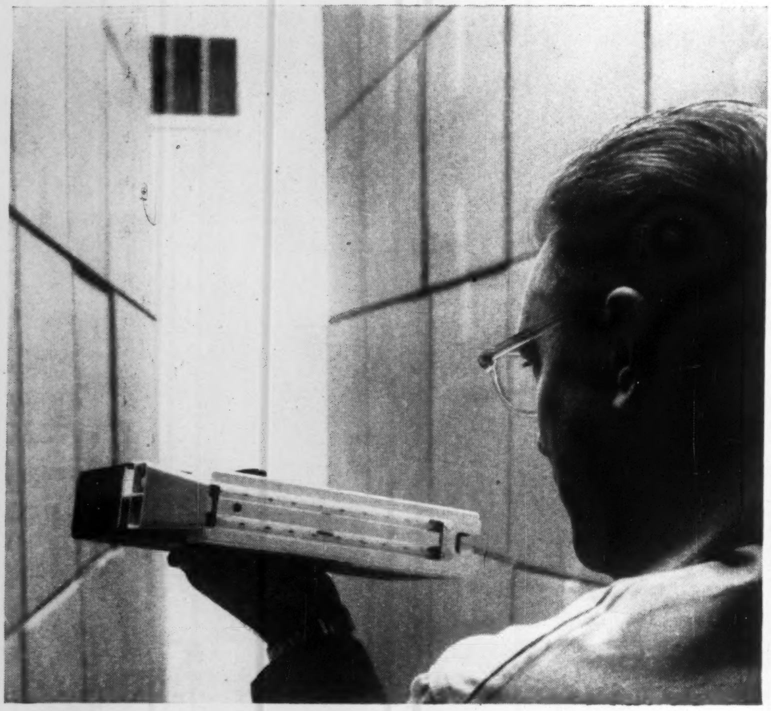
The Weil-McLain "HR" Boiler is worthy of your critical appraisal—send for Bulletin C-188 containing complete engineering data.



WEIL-McLAIN
BOILERS · RADIATORS

WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

Address literature requests to Dept. AA-57



NOW YOU CAN CHECK
RELATIVE HUMIDITY ANYWHERE—
NO SLINGING OR WHIRLING

This brand-new Bendix-Friez Psychron gives you extremely accurate relative humidity and dew point information with just the flick of a switch. It is a battery-powered portable psychrometer designed and manufactured to meet rigid U. S. Weather Bureau specifications.

Unlike ordinary sling psychrometers, the Bendix* Psychron requires no whirling or special technique to operate. Three standard-size flashlight batteries power a tiny fan that draws air over wet and dry bulb thermometers at a rate exceeding 15 F.P.S. As a result, the Psychron can be safely used in close quarters. It has a special thermal shield to avoid radiation effects for use in bright sunshine and built-in illumination for use in dark or poorly lighted areas.

Order direct from us or through our nearest dealer. For further information write: Bendix-Friez, 1494 Taylor Ave., Baltimore 4, Maryland.

*REG. U.S. PAT. PEND.

$68.50

Price includes metal carrying case, nylon neck strap, psychrometric slide rule, 1-oz. plastic water bottle and instruction book containing humidity and dew point tables.

Friez Instrument
DIVISION

Bendix
AVIATION CORPORATION

RECENT TRADE LITERATURE

Continued

Master Fan Corp., Dept. HPAC, 1332 *Channing St., Los Angeles* 21.

▶ *DRAIN PLUG*—New bulletin No. IF-1056 illustrates, describes "Corky" drain plug and water level indicator for compression tanks. Product is said to facilitate draining waterlogged tanks without introducing air into line. Permits air to enter tank while water is siphoned off through boiler drain, says company. *Bell & Gossett Co., Dept. HPAC, Morton Grove, Ill.*

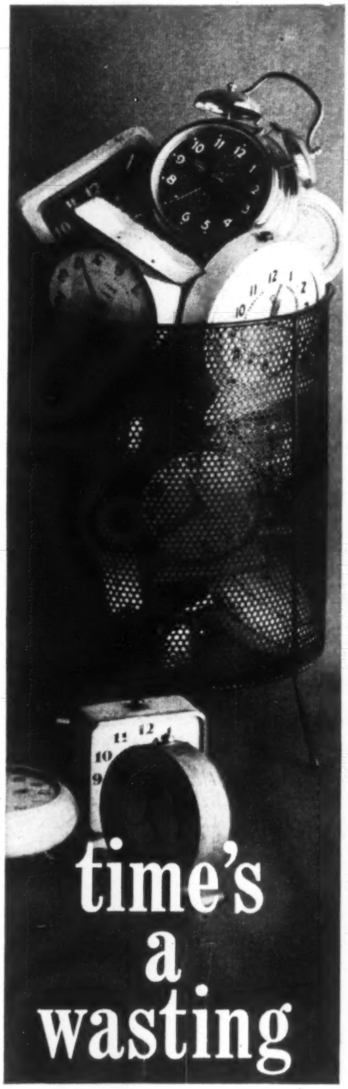
▶ *EXPANSION JOINT*—"GunPakt" expansion joint covered in new 8 page bulletin EJ-1915. Joint features one-piece design of body and gland to eliminate joint. Booklet gives data on how to figure expansion of pipelines, suggestions for installation of expansion joints. *Yarnall-Waring Co., Dept. HPAC, Philadelphia* 18.

▶ *FANS*—Line of adjustable-pitch cooling tower and heat exchanger fans covered in revised bulletin A-111B. Literature contains descriptions, specifications, performance data. *Hartzell Propeller Fan Co., Dept. HPAC, Piqua, Ohio.*

▶ *FANS*—"Aeromaster" fans for air delivery in cooling towers and radiator type coolers described in 4 page form No. 306-M52. Literature covers design, material, production, ease of assembly. Construction features illustrated. *Koppers Co., Inc., Metal Products Div., Dept. HPAC,* 200 *Scott St., Baltimore* 3.

▶ *FILTER-DRIERS*—Line of molecular sieve filter-driers described, illustrated in 4 page bulletin FD-157. Includes cutaway and dimensional drawings, table of capacities and dimensions, test data charts. *Tube Manifold Corp., Dept. HPAC,* 415 *Bryant St., North Tonawanda, N.Y.*

▶ *FITTINGS*—Expanded line of cast brass solder-joint pressure and drain-



The clocks keep ticking away. We need your dollars to make each minute count in the fight against cancer.

With $70, we can buy an eyepiece micrometer . . . $48 buys a laboratory flowmeter...$15 buys an instrument sterilizer . . . $3.75, a hematocrit reader.

Only you can decide how much you can afford to send. But send it *today*, to help us keep moving ahead in the struggle to save lives.

Send a generous check to "Cancer" c/o your local Post Office.

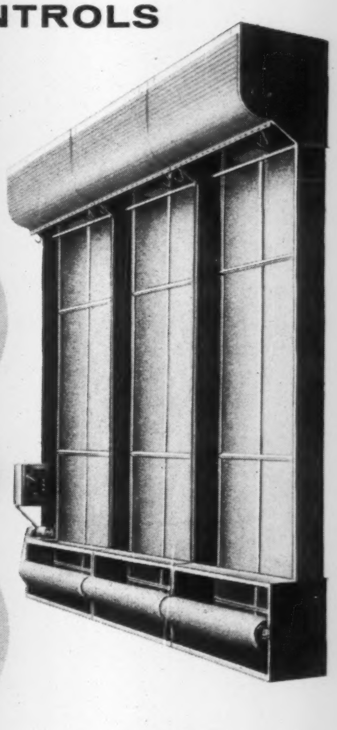
AMERICAN CANCER SOCIETY

GREEN SURE SEAL*

AIR FILTER

BUILT-IN CONTROLS

2 Types



1

Timed Intervals, changing the filter media at predetermined intervals; timing can be changed at will to meet changing conditions.

2

Pressure Differential, changing the filter media whenever clogging raises the pressure differential above a predetermined amount.

Either way, the controls go with the Filter, all assembled and incorporated with it.

Couple either of these sure controls with the proved filtration efficiency and you have an air filter that you can install, push the button and it will go to work and stay at work without attendance until the roll of fresh filter media is used up. Changing the roll which is very easy and a periodic checking to be sure the controls are set for desited conditions are about all you have to do.

You can have confidence in the Green Line of products—which have been world-wide since 1845.

Clean Air
GREEN'S
AIR FILTER

If you are bothered with contaminated air get all the facts concerning the GREEN Sure Seal AIR FILTER. Bulletin 175 gives the details.

*U. S. Patents Pending

THE GREEN
POWER AND PROCESS PLANT EQUIPMENT
FUEL ECONOMIZER COMPANY INC.
BEACON 3, NEW YORK
Representative in Principal Cities

age fittings covered in catalog G-11. Each item illustrated, listed in numerical order with sizes, carton quantity information shown. *Grabler Mfg. Co., Dept. HPAC, 6565 Broadway, Cleveland 5.*

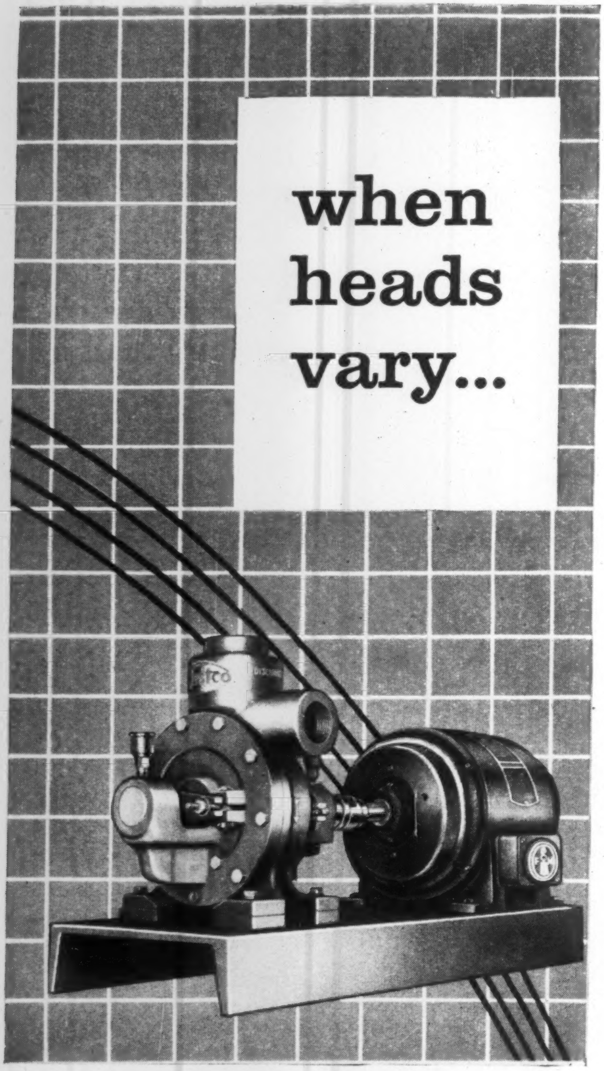
▶ *FITTINGS*—"Speedline" corrosion resistant fittings for stainless steel piping installations detailed in 22 page brochure. Includes photographs, drawings, descriptions, specification tables for various units. *Horace T. Potts Co., Dept. HPAC, Erie Ave. and D St., Philadelphia 34.*

▶ *FIRE DETECTORS*—Unit fire detectors covered in 4 page brochure MC-107B. Models described are hermetically sealed "Detect-A-Fire" units which operate on rate-compensation principle developed by company. Literature details various horizontal and vertical models available, states physical and electrical specifications, gives listings and approvals, offers mounting suggestions for various types of installation. *Fenwal, Inc., Dept. HPAC, Ashland, Mass.*

▶ *FLOAT VALVES*—Features of cushioned float valves explained in new 16 page technical bulletin W-5. Parts lists, dimensions, shipping weights for various sizes, operation, installation, other information included. *Golden-Anderson Valve Specialty Co., Dept. HPAC, 1210 Ridge Ave., Pittsburgh 33.*

▶ *GAGE ACCESSORIES*—Accessories for various types of gages, dial thermometers, recorders presented in 4 page bulletin No. 600. Units include attachments for protecting instrument internals against corrosive media, pulsations in pressures. *U.S. Gauge, Div. of American Machine and Metals, Inc., Dept. HPAC, Sellersville, Pa.*

▶ *GAS-OIL BURNERS*—"Fan-Air" combination gas-oil burners for jobs requiring dual fuels described in 6



Install Fairbanks-Morse Westco peripheral pumps for peak efficiency.

These pumps deliver approximately the same capacity when discharging against high pressure or low pressure—and all at 1750 rpm.! Multi-vaned impeller gives multi-stage performance from a single-stage pump. Ideal as integral parts of machines, units or systems—for circulating hot water, ice water or brine—or for clear water, sump, solvents or chemical fluids, feeding filters or boilers, or for booster service. Capacities to 200 gpm., heads to 600 feet.

See your F-M Pump Dealer or write Fairbanks, Morse & Co., Dept. HPA-5, 600 South Michigan Ave., Chicago 5, Illinois.

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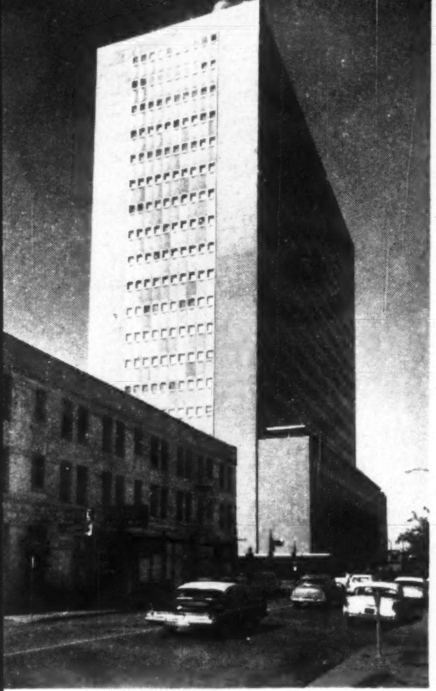


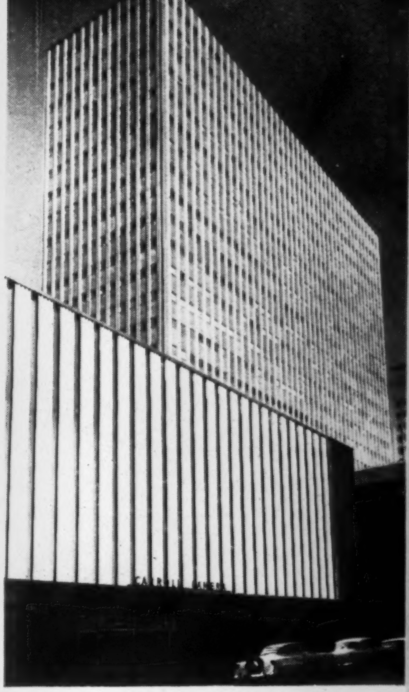
TEXAS NATIONAL BANK BUILDING—Serves as headquarters for the bank and Continental Oil Company, contains 21 floors of office space, has shopping areas on first floor. Sprinkler system serves basement, sub-basement and first floor; uses 5,242 ft. of SPANG Pipe feeding 801 sprinkler heads.

▲

MEDICAL ARTS PARKING GARAGE—This 9-story, 320 car facility has horizontal-vertical elevators which deliver cars automatically in 75 seconds. Sprinkler system protects basement, contains 1,677 ft. of 1" to 5" SPANG Steel Pipe serving 171 sprinkler heads.

TEN-TEN PARKING GARAGE—The south's largest public parking facility has 1500-car capacity, is of ramp-type construction with heliport on the roof. Sprinkler system for sub-basement, basement and first floor shops contains 18,911 ft. of SPANG Steel Pipe feeding 1,507 sprinkler heads.

▼



BANK OF THE SOUTHWEST BUILDING—Houston's newest and largest office building is 24 stories high, contains the largest single banking room in the nation. Sprinkler system for basement, sub-basement and first floor uses 17,000 ft. of SPANG Pipe, has 1,111 sprinkler heads.

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FIRE PROTECTION WITH SPANG® STEEL PIPE

Down Texas way, sprinkler systems must pass the rigid requirements of the Texas Fire Commission. Commission inspectors test the system at 200-pound hydrostatic pressure for two hours. Each system must provide 15 psi residual pressure for 25 gpm water delivery at the top line sprinkler.

Naturally, the Spang Steel Pipe sprinkler systems, installed in these four new Houston buildings, passed these tests and more than met the National Board of Fire Underwriter requirements . . . because Spang Pipe is manufactured under strict *quality-control* conditions, is inspected and tested before shipping to assure a *top-quality* product.

In every type installation, Spang Steel Pipe will give you *top-quality* performance. Try it and see for yourself. For *top-quality* service, contact your local Spang Distributor.

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HEATING
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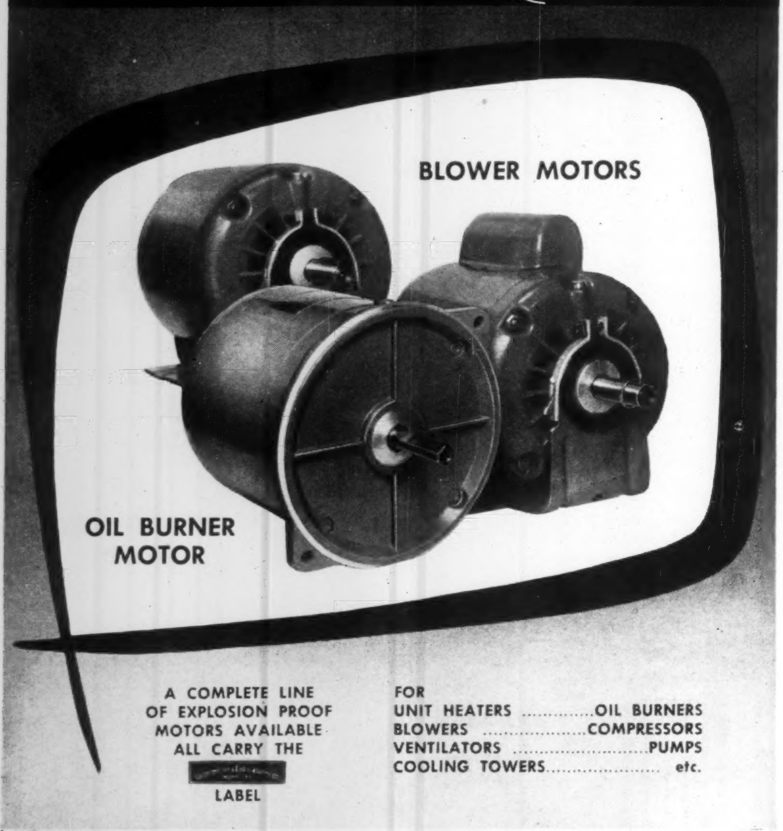
MOTORS



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- SERVICE . . . THROUGHOUT the NATION. There is an ME District Office near you . . . Call our Sales Engineer TODAY to help solve your motor problem.

MOTORS
1/20 HP thru
2500 HP

GENERATORS
1/2 KW thru
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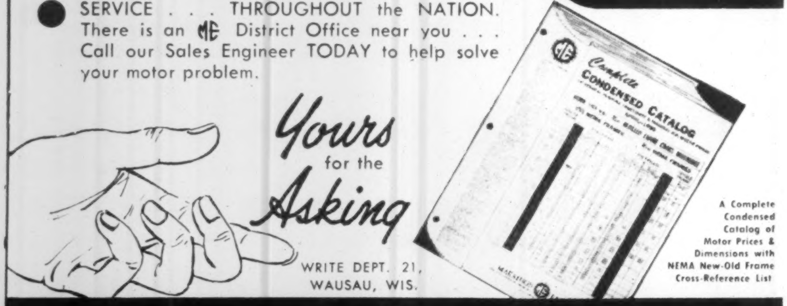

WRITE DEPT. 21,
WAUSAU, WIS.

A Complete
Condensed
Catalog of
Motor Prices &
Dimensions with
NEMA New-Old Frame
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MARATHON ELECTRIC
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FACTORIES AT ERIE, PA. AND EARLVILLE, ILL.
SALES OFFICES IN PRINCIPAL CITIES

RECENT TRADE LITERATURE

Continued

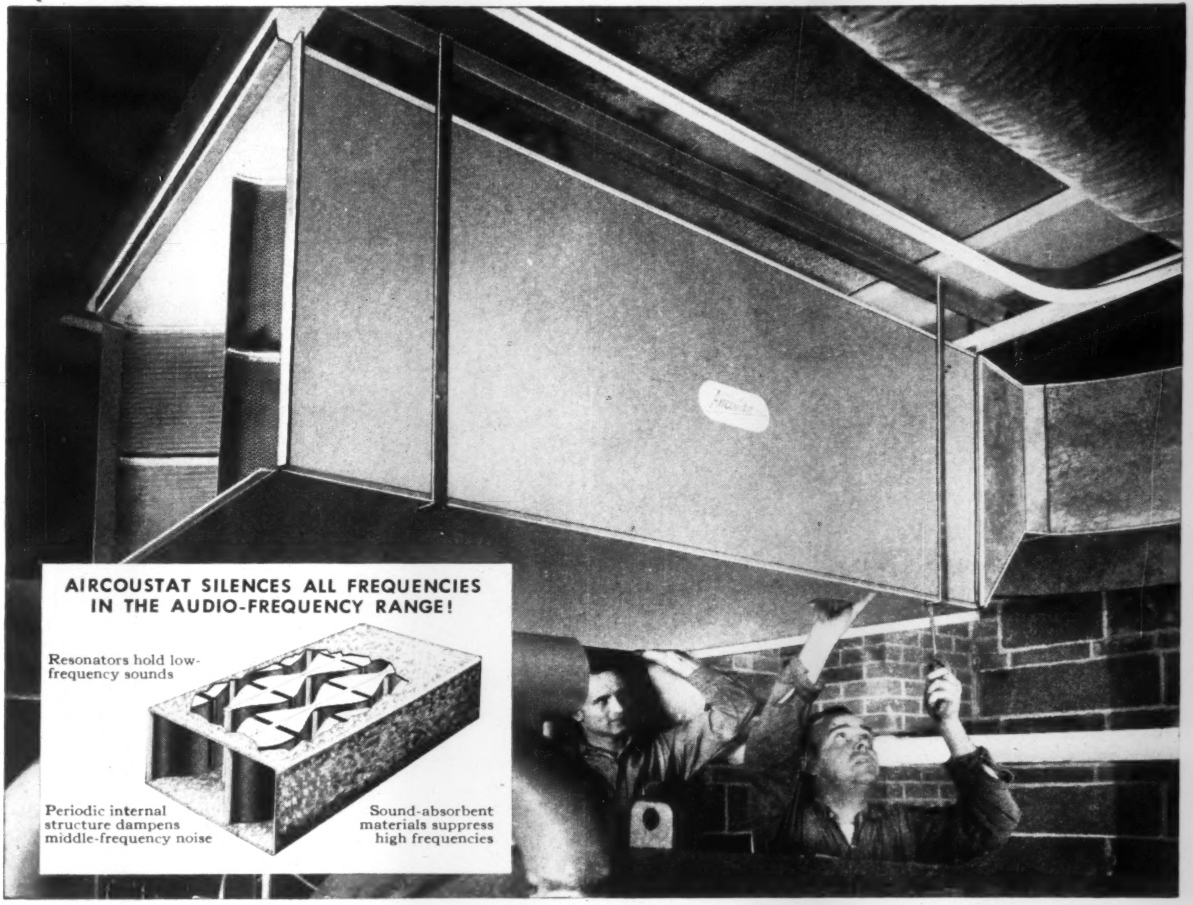
page bulletin GO-200-B. Bulletin, together with companion 4 page supplement covering oil firing side of unit, explains how design improves heating efficiency, lowers fuel costs, increases operating safety, says company. *Mettler Co., Inc., Div. of Eclipse Fuel Engineering Co., Dept. HPAC, 4366 Worth St., Los Angeles.*

▶ *GAS UNIT HEATING—Application of Gas Unit Heating* is title of of pocket-sized bulletin SA-571 which presents variety of information on subject. Material designed to help in determining situations in which this system of heating can be applied, give basic information on selection and installation of proper equipment. *Reznor Mfg. Co., Dept. HPAC, Mercer, Pa.*

▶ *HEAT PUMP*—Twelve page brochure describes compound compression air source heat pump for commercial, industrial use. Contains system diagrams, cost analysis charts, performance charts showing heat output and power consumption comparisons between conventional single-stage heat pump systems and multi-stage system. *York Corp., Industrial Div., Dept. HPAC, York, Pa.*

▶ *HEATERS*—Gas vented recessed heaters described in 4 page catalog. Line includes 25,000 and 35,000 Btu input single-vented models, 50,000 Btu input dual-vented unit. Literature contains illustrations, descriptions, specifications; provides control selection information, ordering instructions. *Peerless Mfg. Corp., Dept. HPAC, 14th and Ormsby, Louisville.*

▶ *HEATING, VENTILATING*—"Comfort Curtain" heating and ventilating system for schools detailed in new 24 page brochure. Describes manufacturer's "Living Laboratory" research school building in which system is installed. Includes information on distribution system,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Resonators hold low-frequency sounds
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AIRCOUSTAT* Sound Traps eliminate air conditioning noise at 50% less cost

Acoustical Performance Guaranteed. Easy to Install. Pre-Engineered — No Design or Layout Headaches.

Revolutionary Aircoustat Sound Traps require no special tools for installation . . . reduce your labor costs and lower your installation time. Units fit any size or shape of duct. If Aircoustat fits *geometrically,* it fits *acoustically*.

Aircoustat is the most efficient method of sound-deadening you can provide your customers. A 7-foot Aircoustat unit suppresses as much sound as 100 feet of ordinary duct lining. Aircoustat eliminates all frequencies in the entire audio-frequency range, silences entire systems or selected outlets. Flow resistance and pressure drop are lower. 4 series cover applications ranging from general offices to recording studios.

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Engineered* Products Sold with *Service

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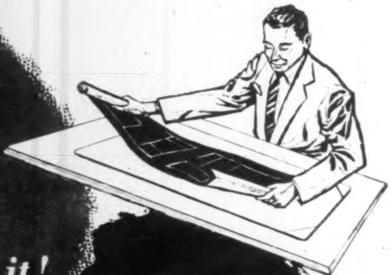
for a "beautiful" job of distributing air where you want it!



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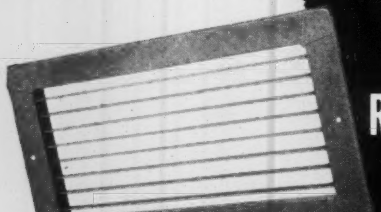
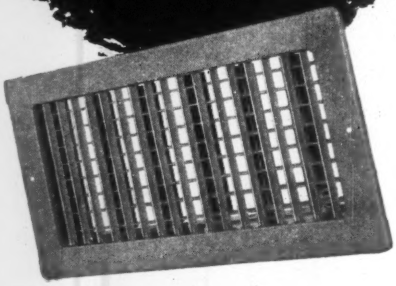
Flexi-Trol

COMMERCIAL AIR CONDITIONING REGISTERS and GRILLES

Completely Adjustable



- Single and Double Deflection Grilles and Registers featuring completely adjustable 4 directional air control



The attractive appearance of the new Lima Flexi-Trol air conditioning line matches the "beautiful" job it does in meeting air deflection requirements for maximum comfort and efficiency.

Features include: adjustable face bars with positive friction to prevent accidental movement . . . heavy gauge steel frame, resistance welded . . . reinforced corners for added strength . . . quiet operation without rattling or whistling . . . double overlap opposed valves . . . permanent Lima rust-resisting finish in neutral tone. Can be repainted if desired.

Write today for literature and specifications on the new Lima Flexi-Trol Commercial Air Conditioning Line.

Lima REGISTER COMPANY
1796 N. Cable Rd., Lima, Ohio

sold exclusively through heating wholesalers and manufacturers

RECENT TRADE LITERATURE

Continued

air processing unit, outside air intake, heating source, control. Contains dimensional drawings. *Lennox Industries, Inc., Dept. HPAC, Des Moines, Ia.*

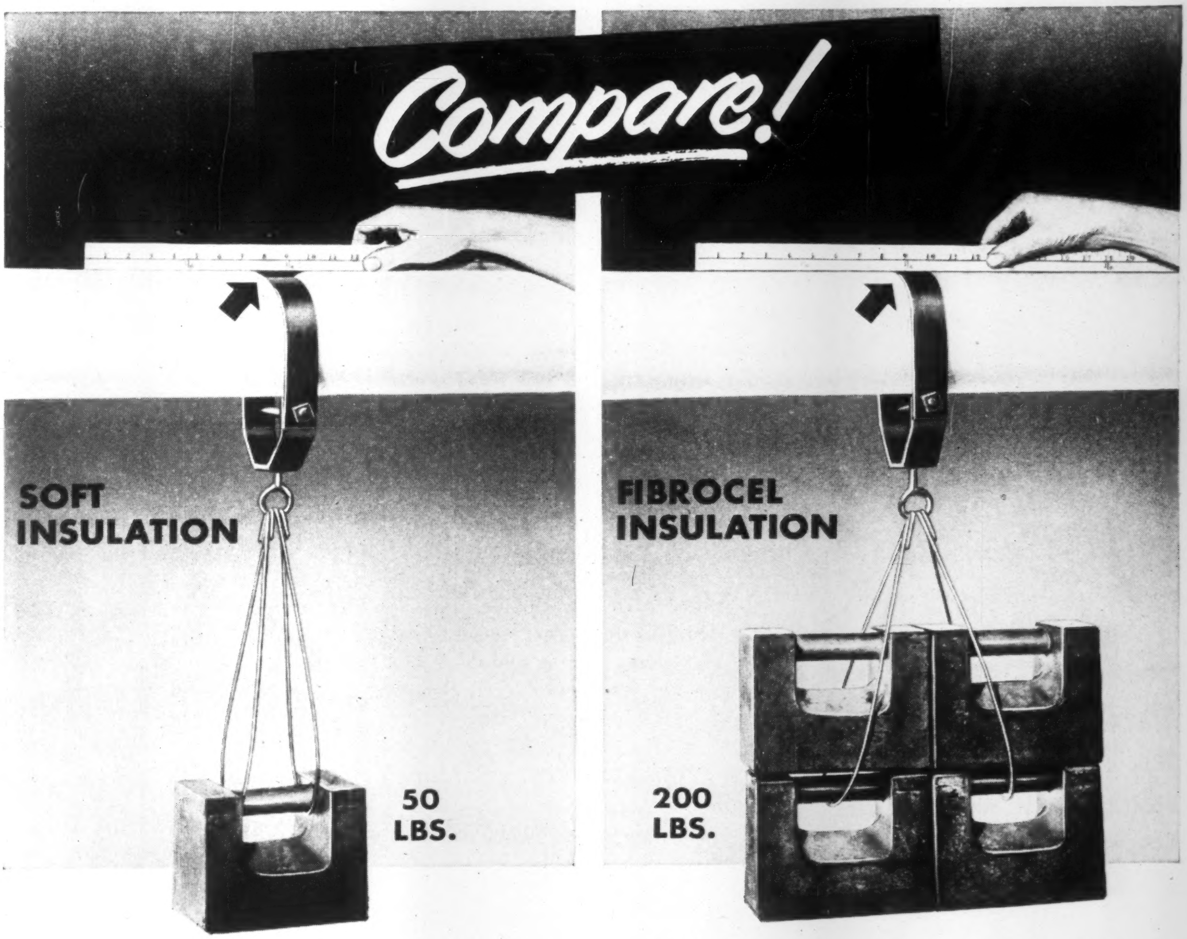
▶ *HOSE CLAMPS*—Folder describes "triple-locking" benefits gained by "internesting" feature of company's hose clamps. Contains information on two tools available for application. *Punch-Lok Co., Dept. HPAC, 321 N. Justine St., Chicago 7.*

▶ *HYDRAULIC PILOT VALVE*—Spring loaded, diaphragm actuated hydraulic pilot valve described in catalog sheet. Literature contains photographs, cutaway diagrams, features, recommended applications, specification instructions. *Atlas Valve Co., Dept. HPAC, 280 South St., Newark 5.*

▶ *INSTALLATION SUPPLIES*—Eight page catalog describes "Globe" fixtures used in installing heating, air conditioning, sprinkler systems. Products covered include steel inserts to hang overhead piping in concrete, split ring hangers, I-beam clamps and retaining rings, underground hanger clamps, steel ceiling plates and ceiling buttons, adjustable swivel hangers. *Huppower Div., Hupp Corp., Dept. HPAC, 7450 Melville Ave., Detroit 17.*

▶ *INSULATION JACKETING*—Suggested specifications for installation of "Al-Cor-Jac" corrugated aluminum jacketing contained in 4 page folder. Product recommended by company for indoor and outdoor insulated pipe lines. *Aljon Mfg. Co., Inc., Dept. HPAC, 54-18 43rd St., Maspeth, N.Y.*

▶ *LIQUID LEVEL CONTROLS*—Brochure details "Magnetrol" liquid level controls for industrial applications. Illustrates operating principle. Contains photographs, descriptions,



Compression test proves J-M Fibrocel® Insulation retains *FULL-WALL* thickness!

ONLY FIBROCEL OFFERS ALL THESE ADVANTAGES

No shrinkage—eliminates gaping joints. **Resists compression**—retains full-wall thickness. **Uniform dimensions**—precision formed for exact fit. **Economical application**—lightweight, easy to cut with a knife. **Thermally effective. Long lasting**—flame, rot, odor and vermin proof.

the new molded silica insulation developed for plumbing, heating, chilled water and dual service applications in the 35F to 300F temperature range

The illustrations tell you why Fibrocel maintains its insulating effectiveness . . . why it stands up under operating abuse which often impairs the performance of softer insulations.

At top left, a *single* 50-lb. weight noticeably crushes the soft ordinary insulation. But note that *four* of these same weights cause no deformation or compression in Fibrocel. *This means full insulating effectiveness!*

Fibrocel's added firmness and strength take on even more importance when a vapor seal jacket is involved. For Fibrocel offers substantially greater back-up protection against jacket punctures.

Fibrocel speeds installation, too! It is light in weight and a pleasure to apply. It cuts cleanly, easily with a knife. And its firmness and remarkable dimensional uniformity assure long-lasting, tight, smooth joints!

For further information on Fibrocel, write Johns-Manville, Box 14, New York 16, N. Y. (In Canada, Port Credit, Ontario.) Ask for brochure IN-155A.

Johns-Manville *first in* **INSULATION**

MATERIALS · ENGINEERING · APPLICATION

ATTENTION CLEVELAND!

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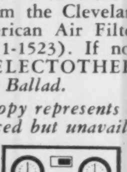
Clevelander eradicates Mr. Entropy*— stops steam waste with SELECTOTHERM

Around Cleveland, Don Shanck, 412 Superior Avenue, is famed for getting rid of steam waste in schools and other buildings where boilers are used for steam heating.

He does it with SELECTOTHERM, the high-vacuum heating system that automatically provides steam at the proper pressure and temperature for perfect comfort. Installation records show that SELECTOTHERM cuts the fuel bill 19% or more—*enough to pay for the system within five years!*

SELECTOTHERM applies the control directly to the boiler, adds to the effectiveness of unit ventilators and individual room control. Get the whole story. If you're from the Cleveland area, call Don at American Air Filter Company, Inc., (Main 1-1523). If not, write for fact-filled SELECTOTHERM booklet, *Boiler Room Ballad.*

* *Mr. Entropy represents the heat that is produced but unavailable for use.*



SELECTOTHERM
HEATING CONTROL SYSTEM ®

A product of Illinois Engineering Co.
Division of American Air Filter Co., Inc.
2035 South Racine Ave., Chicago 8, Illinois

specifications, prices. Includes order blank for specific applications. *Meters and Controls, Inc., Dept. HPAC, 444 N. LaSalle St., Chicago 10.*

▶ *MASONRY ANCHORING, DRILLING DEVICES*—Catalog No. 557 contains over 200 listings showings sizes, packing, shipping weight, prices of anchors, drills, drill hammers designed for "fastening anything to masonry." *Rawlplug Co., Dept. HPAC, New Rochelle, N.Y.*

▶ *MILLIVOLTMETER RECORDER*—Portable millivoltmeter recorder for use in electrolysis survey work described in 4 page bulletin E1117. Covers use of instrument in surveys of electrolytic corrosion, deterioration of underground structures such as pipes, cables. *Bristol Co., Dept. HPAC, Waterbury 20, Conn.*

▶ *MULTIPLE FEED OILERS*—Bulletin No. 33-A describes multiple feed oilers said to provide simple, more accurate feed control through use of new tapered feed adjustment screws. Includes photographs, drawings, construction features of units in line. *Trico Fuse Mfg. Co., Dept. HPAC, 2948 N. Fifth St., Milwaukee 12.*

▶ *PIPE JOINING*—Bulletin 75C supplement introduces company's new "Offset Rolls and Gage" designed to reduce industrial pipe and elbow edging to single operation. Feature is available for both company's hand and power rotary combination machines, says manufacturer. *Niagara Machine & Tool Works, Dept. HPAC, 683 Northland Ave., Buffalo 11.*

▶ *PIPE MARKING*—"How to select best self-adhesive pipe marking materials" is theme of new 8 page catalog. Literature lists over 500 vinyl plastic pipe markers, other self-adhesive products for use by plant maintenance and safety engineers. *Printed Cellophane Tape Co., Dept. HPAC, 521 N. La Brea, Los Angeles.*

HOW TO CUT APPLICATION COSTS
in Protecting Pipe and Pipe Joints Against Corrosion

Let TAPECOAT® do the job without Kettles, Hot Stuff, or Special Crews

When specifications call for hot applied coal tar protection of underground piping as in AWWA specifications C-203 and C-204, and the volume does not justify the cost of shipment to a mill for coating—TAPECOAT offers a practical solution. Here is a widely-accepted alternate material that is equivalent to mill-applied hot coal tar protection.

With this coal tar coating in handy tape form, piping contractors can use their own personnel to do the job because technical know-how and special equipment are not required. You save time and money and eliminate the need for sub-contracting in assuring the long-life protection called for.

TAPECOAT is easy to apply, using a torch to soften and bleed the pitch which provides both bond and protection. Available in widths of 2", 3", 4", 6", 18" and 24", it is spirally wrapped or cigarette wrapped around the vulnerable surfaces.

Since 1941, TAPECOAT has proved its ability to fight corrosion on pipe, pipe joints, mechanical couplings, conduit, cable and insulated piping.

Write for illustrated brochure.

The TAPECOAT® Company
Originators of Coal Tar Coating in Tape Form
1555 Lyons Street
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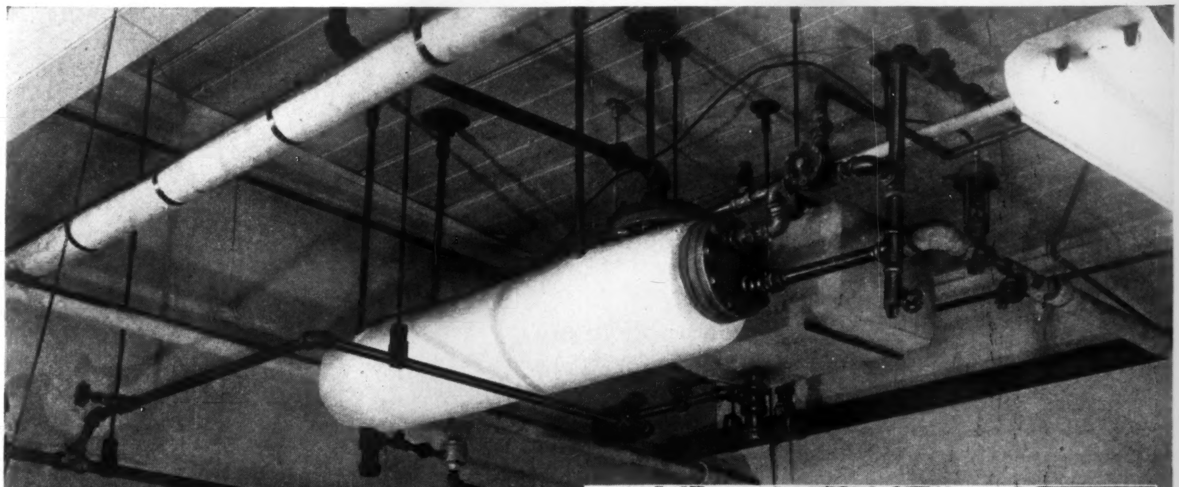
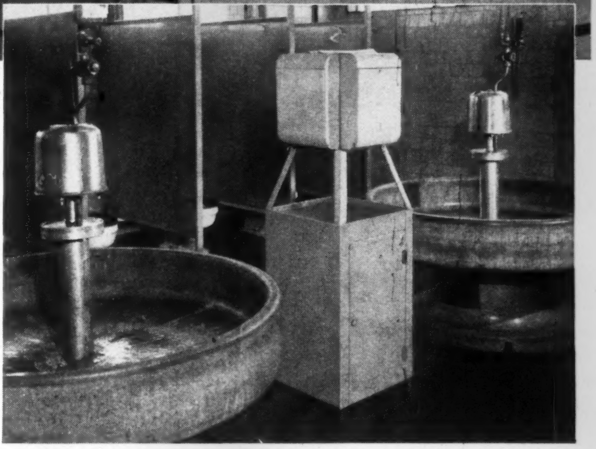
ECONOMICAL HOT WATER SOURCES FOR MODERN INDUSTRY

UNIVERSAL WINDING CO.
Saves by "spotting" Water Heaters on Location





GENERAL Instantaneous Water Heater at Universal Winding Company, well-known textile machinery manufacturer, is on ceiling, well out of the way. This single unit supplies eight hot water faucets and 3 Bradley 54" wash basins. Heater measures 42¼" in length, 11⅞" in diameter — can deliver up to 64 gallons per minute of hot water raised from 40° to 140°.

Here's another modern plant that's discovered the high-efficiency, space-saving way to keep hot water supply in step with expansion and modernization . . . GENERAL Instantaneous Water Heaters. Universal Winding Company, Providence, R. I., "spots" these compact steam-heated units wherever they're needed throughout the plant. No bulky storage tanks . . . no heat-wasting runs of hot water piping. GENERAL Water Heaters install *at* the steam line, save time and insulation costs . . . provide plenty of hot water even during peak demand periods.

Many of today's plants are also using GENERAL Instantaneous Water Heaters as booster installations and in complete, centralized systems. They're available in a wide range of capacities up to 300 gallons per minute. For use with live or exhaust steam at 5 to 125 psi, or boiler water. Write for Catalog 61. General Fittings Company, Box 151E, East Greenwich, Rhode Island.

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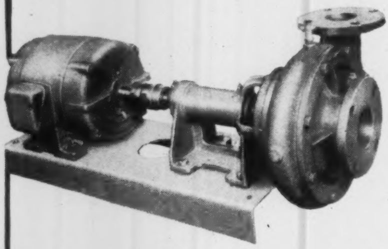
COMPANY

TANKLESS AND INDIRECT WATER HEATERS AND HEATING SPECIALTIES

CARVER MODEL B PUMPS

. . . the Air Conditioning Pumps primed with Extra Values . . . your best buy for Cooling Towers, Chill Water Circulation and Hot Water Heating Systems.

Choose from CARVER'S complete line of reliable, versatile pumping units that feature Quiet, Vibration-Free Operation, Maximum Performance, Efficiency and Economy.



Carver *close-coupled* Electro-pumps as well as Carver *base-mounted* Pumps are available in all sizes with capacities up to 1000 G.P.M. and heads up to 240 feet.

Excellent as original equipment. Modern in design, pleasing in appearance, they add the final touch to fine equipment.

CARVER PUMP COMPANY
1460 Hershey Ave.
Muscatine, Iowa

CARVER
the quality name in pumps

RECENT TRADE LITERATURE

Continued

▶ *PLASTIC PIPE CLAMPS*—Two page catalog PP-1256-15 shows general specifications, descriptive data on "Sure-Tite" stainless steel clamps for plastic pipe. *Wittek Mfg. Co., Dept. HPAC, 4305-37 W. 24th Pl., Chicago 23.*

▶ *PLASTIC PIPE, FITTINGS*—New 8 page booklet covers line of "pressure-rated" plastic pipe and fittings for commercial, industrial, construction uses. Tables provide pressure drop of water data, pressure-temperature ratings, and recommended pumping depths for company's flexible polyethylene pipe. *Crane Co., Dept. HPAC, 836 S. Michigan Ave., Chicago 5.*

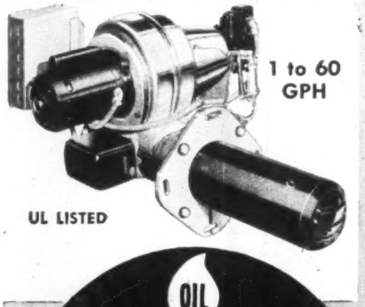
▶ *PRESSURE TUBING*—"Nylaflow" pressure tubing, related installation tools detailed in 4 page bulletin BR-3A. Literature describes characteristics, installation advantages of the flexible polyamide tubing along with available sizes, information on where to advantageously use tubing. *Polymer Corp. of Penna., Dept. HPAC, Reading Pa.*

▶ *PUMPS*—Bulletin HQ-856 covers base-mounted universal pumps for circulating hot water heating, chilled water cooling systems. Lists pump features, gives typical specification form. Includes cutaway diagram, detailed capacity and size information. *Bell & Gossett Co., Dept. HPAC, Morton Grove, Ill.*

▶ *PUMPS*—Submersible and "Multi-Depth" water system pumps—designed to have no vanes, turbines or impellers and have only one moving part of stainless steel turning in abrasion resistant rubber stator—described in new catalog. *Continental Pump Co., Dept. HPAC,* 1027 *S. Vandeventer Ave., St. Louis* 10.

▶ *PUMPS*—Pump selector chart, designed to aid users of fluid handling equipment in choosing right unit for

LOOK AT THIS NEW
FORCED-DRAFT BURNER
THAT DELIVERS BIG
PERFORMANCE



OIL syncro flame OIL

FOR COMMERCIAL AND INDUSTRIAL INSTALLATIONS

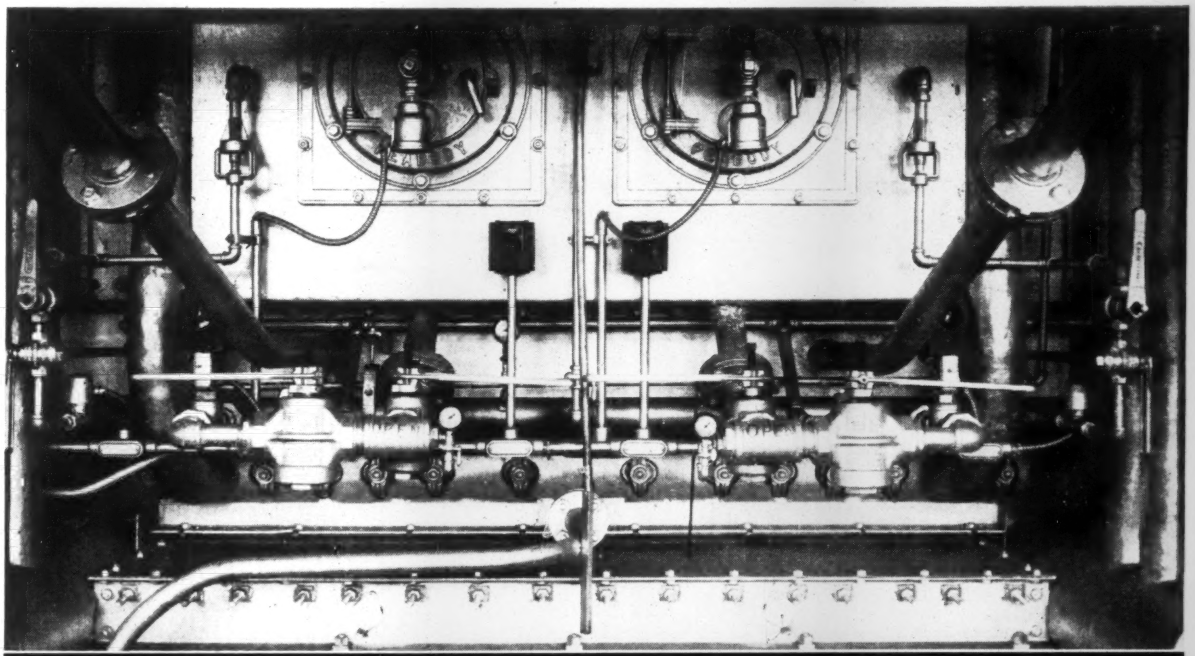
While this burner *looks* like a standard residential type, it is a *big* heavy-duty machine. Features include two-stage fire, built-in controls for pre-purge, post-purge, and high-low-off fire control with automatic air/fuel ratio settings, terminal strips for accessory wiring, and wide ranges of capacities.

FOR 20 TO 150 H.P. BOILERS
HIGH STACK NOT REQUIRED

SYNCRO/FLAME Pressure Burners are capable of firing efficiently into combustion chamber pressures of 3" of water or more, eliminating the need for high stacks or expensive forced draft equipment. *No ordinary burner can do this!* SYNCRO/FLAME Pressure Burners are available for oil, gas, or dual-fuel service.

DETAILS ON REQUEST
Write today for data sheets describing all features and giving full specifications.

MANUFACTURERS OF OIL AND GAS AND OIL/GAS BURNERS
SYNCHRONOUS FLAME, INC.
WALWORTH • WISCONSIN



controlling gas to furnaces and boilers . . .

AN IMPORTANT JOB DONE BY

HOMESTEAD *Lubricated* PLUG VALVES

AT A. B. DICK COMPANY, CHICAGO

HOMESTEAD
200 OWG
150 SWP
PAT. PEND.

An analysis of numerous types of valves convinced the A. B. Dick Company that HOMESTEAD Lubricated PLUG VALVES were well suited for use on gas lines to furnaces and boilers in their Chicago, Illinois plant. In fact, there are more than 5,000 Homestead Valves of various types in this plant. Satisfactory performance from the valves they have chosen is guaranteed by built-in features such as:

1. 100% Pipe Area—streamlined ports—minimum resistance to flow—minimum pressure drop.
2. Controlled Pressurized Lubricant System prevents sticking, by instant piston-like movement of plug at start of lubrication.
3. Extruded lubricant around stem indicates system is full; serves as stop signal to prevent overlubrication. No clogging of low pressure lines with lubricant, fouling of meters, orifices, etc.
4. Triple Head Seal—two rings of lubricant and reinforced Teflon stem seal. Stem seal holds pressure even without lubrication.

. . . plus many others. To know the meaning of real valve economy and service, install a few of these valves under your own service conditions. You'll be glad you did.

Your copy of Valve Reference Book No. 39-5 showing Homestead Lubricated Plug Valves will be sent on request.

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Company________________________

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HOMESTEAD VALVE MANUFACTURING COMPANY
P. O. BOX 128 *"Serving Since 1892"* CORAOPOLIS, PA.

APPLYING INSULATION TO PIPING?

There are 12 sound reasons why you should try:

Swift's

Improved

LAGGING ADHESIVE

There is an improved way to apply insulation. Whether you're bonding insulation to piping or adhering lagging cloth to insulation, Swift's Lagging Adhesives give you 12 important advantages:

1. EASY TO USE
2. FAST SETTING
3. NON-HAZARDOUS
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5. MOISTURE RESISTANT
6. MOLD RESISTANT
7. GOOD UNDERCOATING FOR PAINT
8. ADHESIVE PROPERTIES
9. FLEXIBILITY
10. SAVES PAINT
11. UNIFORM
12. MEETS ACCEPTED SPECIFICATIONS

See the superiority of Swift's new Lagging Adhesives *for yourself* . . . Write for details on an introductory trial shipment, at quantity price.

SWIFT & COMPANY
Adhesive Products Dept.,
4115 Packers Ave.,
Chicago 9, Illinois

WRITE FOR LITERATURE

Swift
102nd YEAR

To Serve Your Industry Better

RECENT TRADE LITERATURE

Continued

particular job at hand, is feature of catalog form No. 347. Data folder gives heads, capacities, horsepower ratings, other information. *Barnes Mfg. Co., Dept. HPAC, Mansfield, Ohio.*

▶ *PURIFIERS*—1957 catalog, bulletin 801, itemizes principal applications of company's purifiers designed to prevent mist carryover from process vessels; remove compressor oil, condensate, etc., from steam, air, gas vapor; separate solids and liquids from natural gas; eliminate condensate, oil, etc., from steam systems. *V. D. Anderson Co., Dept. HPAC, 1935 W. 96th St., Cleveland 2.*

▶ *REGULATORS*—Revised size, capacity, weight tables necessitated by doubling of maximum inlet pressure of company's "120" sensitive regulators are included in revised 4 page bulletin No. 1044. *Rockwell Mfg. Co., Dept. HPAC, 400 N. Lexington Ave., Pittsburgh 8.*

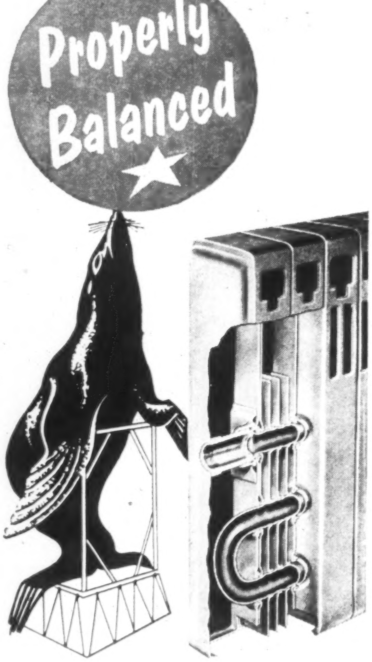
▶ *REGULATORS*—Revised 12 page bulletin No. 1082 describes "014" low pressure balanced valve regulators. Includes schematic drawings, photographs, descriptions, tables of specifications. *Rockwell Mfg. Co., Dept. HPAC, 400 N. Lexington Ave., Pittsburgh 8.*

▶ *REPEAT CYCLE TIMERS*—Bulletin AWH RC201 replaces page 3 of company's current catalog. Contains details on function of three basic-miniature repeat cycle timers, along with dimensions for a-c, d-c, 400 cycle units. *A. W. Haydon Co., Dept. HPAC, Waterbury, Conn.*

▶ *SAFETY PANELS*—Two page form No. 18-705 presents "expandable" safety panels designed for protection and automatic operation of unattended or remotely controlled engines. Units available for both battery and magneto type ignitions as well as diesels. *Stewart-Warner Corp.,*

ONLY SHAW radiators

deliver radiant and convected heat

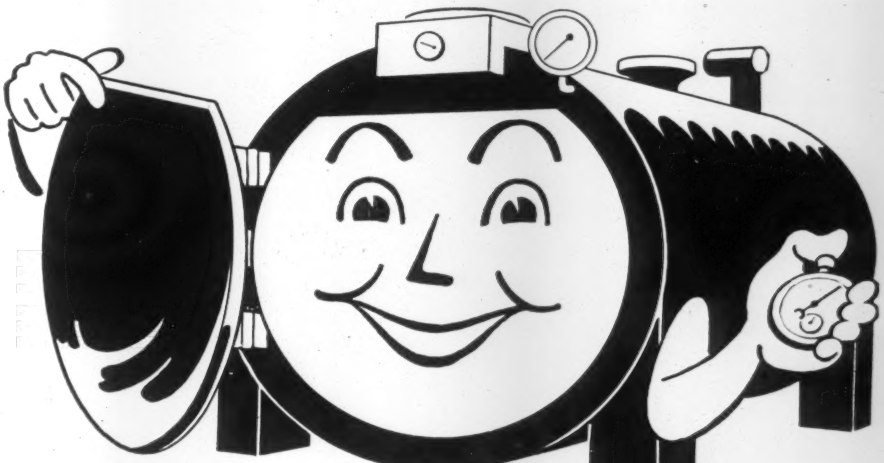


Shaw Panel Radiators distribute a carefully engineered combination of radiant and convected heat that only Nature, at her best, can rival.

Shaw's health-guarding proportions of radiant and convected heat will not vary regardless of hot water or steam temperature. There is no stratification – heat is distributed evenly throughout the room.

Investigate Shaw Panel Radiators. They are rugged, self-contained steel and copper units, of one-piece-bonded construction, easy to handle and install. Heights are 8″ to 26″; lengths 11″ to 111″. Choice of same end or opposite end tapping on all models facilitates piping economies and proper radiator location. Write today for full information.

SHAW-PERKINS
MANUFACTURING COMPANY
201 East Carson St. • Pittsburgh, Pa.



The Boiler that saves maintenance time

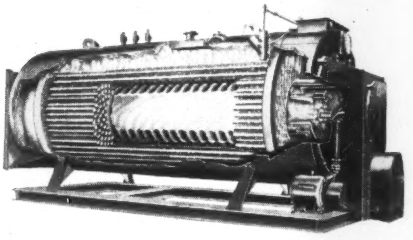
It's always easy to gain access to a Continental Automatic Boiler. For routine servicing, all doors — front, rear, and burner — are hinged. Simplified design eliminates need for refractory baffles or partitions which might burn out, leak, and cause short circuit of gases.

Low maintenance is one of the important cost-saving features of every Continental Automatic Boiler. Controls are simplified and dependable, requiring practically no attention. Heating surfaces stay clean, because of Continental's free, rapid water circulation. And openings are provided to facilitate inspection of steam and water space.

Continental's simple, practical two-pass design with the exclusive "spinning gas" feature means that all return tubes do equal work at equal temperatures, last longer, provide full access to all fire surfaces. And every Continental Automatic Boiler is fire-tested before shipment, to insure a guaranteed efficiency in excess of 80%, and a long, trouble-free, low-maintenance life. For more details, ask for Bulletin BE-3.

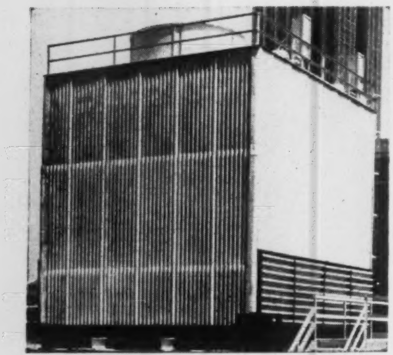
BOILER ENGINEERING & SUPPLY COMPANY, INC.
8 Manavon Street, Phoenixville, Pa.

The Continental
AUTOMATIC BOILER



Cut-away view of typical Series A Continental Automatic Boiler, firing oil and/or gas.

A HALF CENTURY OF BOILER MANUFACTURING EXPERIENCE

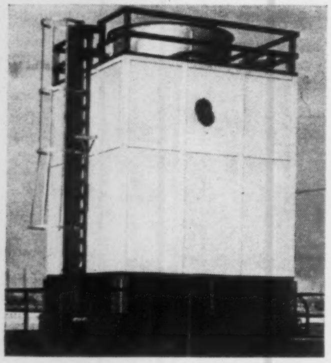


The Phillips Transite Cooling Towers have been in operation over nine years and proven to furnish the required cooling with lowest possible maintenance cost. Phillips Towers are available with framing of California Redwood or Hot Dipped Galvanized Steel as preferred.

The new Phillips nailless fill adds to simplicity of erection and maintenance.

The Phillips eliminator system guarantees minimum drift loss.

When you have a cooling problem call your Phillips representative.



Phillips Cooling Tower Co., Inc.
220 DUPONT ST., BROOKLYN 22, N. Y.

RECENT TRADE LITERATURE

Continued

Dept. HPAC, 1826 *Diversey Pkwy., Chicago* 14.

▶ *SHEET METAL WORKING MACHINES*—New 40 page booklet 203 summarizes data on power operated machines for sheet metal work. Includes data on each series in line. Basic specification charts provide reference to principal models. *Niagara Machine & Tool Works, Dept. HPAC,* 683 *Northland Ave., Buffalo.*

▶ *SMOKE DENSITY INSTRUMENT*—"Smokescope" optical instrument designed for making accurate estimations of smoke density in stack effluent described in two page bulletin No. 0811-3. *Mine Safety Appliances Co., Dept. HPAC,* 201 *N. Braddock Ave., Pittsburgh* 8.

▶ *SOUND CONTROL PANELS*—"Soundmetal" panels designed to suppress industrial noises described in 4 page form No. 386-M57. Panels are said to be economical, versatile, efficient. Literature illustrates typical applications, contains table of sound characteristics. *Koppers Co., Inc., Metal Products Div., Dept. HPAC,* 200 *Scott St., Baltimore* 3.

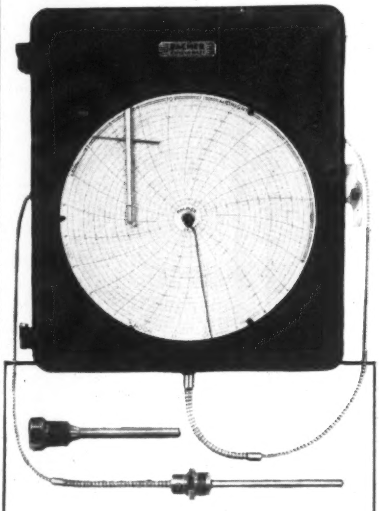
▶ *SOUND TRAPS*—Four page form No. 280-M51 covers "Aircoustat" sound traps for air conditioning systems. Describes, illustrates model for low pressure systems and "Hi-Valve" combination pressure reducing valve, mixing chamber and sound trap. *Koppers Co., Inc., Metal Products Div., Dept. HPAC,* 200 *Scott St., Baltimore* 3.

▶ *STAINLESS STEEL*—Four page technical sheet gives information on chromium, nickel, manganese stainless steel type 201. Includes information on analysis range, resistance to corrosion and oxidation, physical and mechanical properties. Short sections cover welding characteristics, fabrication. *Allegheny Ludlum Steel*

PALMER

MERCURY ACTUATED
recorders

Into this modern Mercury Actuated Recorder has gone all the skill of Palmer master craftsmen.



Readings are clearer, smoother and more precise than ever thought possible. In fact readings are so amazingly improved that maintenance is never needed under normal uses.

Recording Thermometers feature twelve inch die-cast aluminum case with black wrinkle or white satin finish. Single or multiple pen construction. Electric or spring wound clock, 24 hour or 7 Day Revolution. Flexible Armor and bulb of stainless steel. Ranges —40 to 1000°F. or Equivalent in °C.

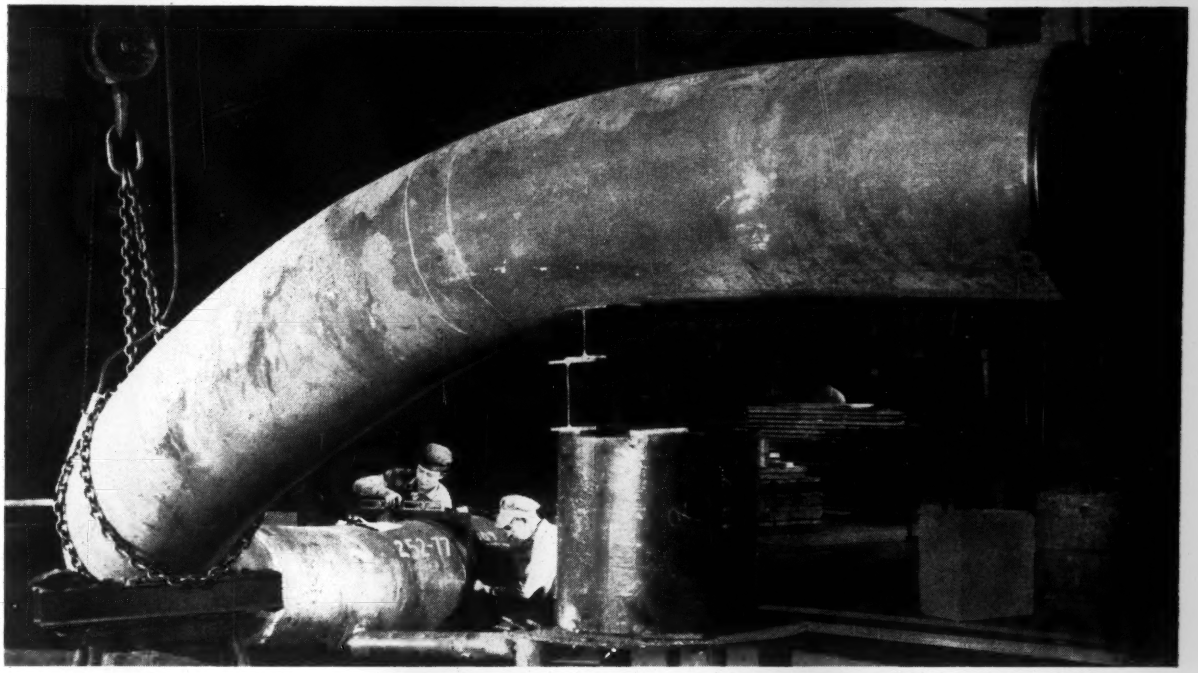
Send for Bulletin No. 45

Consult your Classified Directory

PALMER
THERMOMETERS, INC.

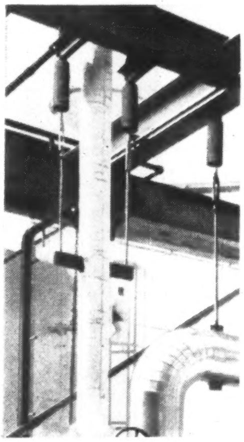
Mfrs. of Industrial Laboratory,
Recording and Dial Thermometers
Cincinnati 12, O.

BLAW-KNOX has what it takes—to provide these products and services



Large chrome moly pipe being readied for shipment to new generating station. Making a right angle bend followed by a 24 degree, 18 foot bend in this heavy 27½ inch chrome moly pipe required all the skill and modern facilities of the Blaw-Knox power piping shop. Before shipment, piping is heat-treated and ultrasonically tested with a radar-type device for detection of any defects.

A new Blaw-Knox "6 x 6" Flexibility Matrix Method of computing stresses in power piping systems is now available to consulting engineers, companies, and individuals responsible for the design of power piping systems. By the use of an electronic computer this method cuts calculating time from months to a day; assures full accuracy to six significant figures; and has no limitations on the complexity of the system. Write for further information about our new "6 x 6" Flexibility Matrix Method.



◀**Two-way control over movement of piping** is provided by Blaw-Knox functional spring hangers with the patented internal swivel action—shown in this modern outdoor generating station. Our experienced engineers are available to both design and make recommendations for your hanger requirements. To get full information, write for Catalog No. 54.

Each year serious fire strikes one out of every seven manufacturing firms in this country. Be safe. Let a Blaw-Knox fire-protection engineer study your needs—and explain how you can pay for the system on our lease or deferred payment plan. To get more information send for Bulletin No. 2426—"Fire Can Destroy Your Business."▶

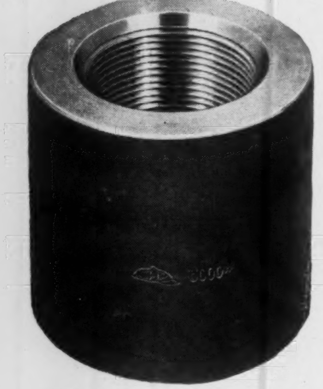
BLAW-KNOX

BLAW-KNOX COMPANY

Power Piping and Sprinkler Division
829 Beaver Avenue • Pittsburgh 33, Pennsylvania

Complete facilities for prefabrication and erection of piping systems for all pressures and temperatures
. . . complete line of standard and custom-engineered pipe hangers, supports and vibration eliminators
. . . complete line of automatic sprinkler systems for standard and special hazards

for peace of mind
when the
pressure is on...



...Capitol 3000# and 6000# forged steel couplings

for all high-pressure installations

Full couplings and half couplings are available from stock for prompt shipment in all sizes from 1/8" through 4".

Manufactured to ASTM Specifications A-105.

ORDER EVERY TYPE OF COUPLING FROM

CAP CAPITOL
MFG. & SUPPLY CO.
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COUPLINGS — NIPPLES — UNIONS —
BUSHINGS — PLUGS — REDUCERS —
CAPS—CAPADAPTERS—WELL SUPPLIES

RECENT TRADE LITERATURE

Continued

Corp., Dept. HPAC, 2020 Oliver Bldg., Pittsburgh 22.

▶ *STAINLESS STEEL*—Sixteen page brochure contains winning entries in company's first annual awards program. Contains articles on design of stainless steel curtain walls, selection and application of stainless steel in chemical process industry, how to form stainless steel. *Allmetal Screw Products Co., Inc., Dept. HPAC, 821 Stewart Ave., Garden City, L.I., N.Y.*

▶ *STEAM SPECIALTIES*—Bulletin DS-260 contains information as to sizes, styles, capacities of company's steam specialty line including "No. 44" hermetic "lifetime" valve, bucket traps, float-thermostatic traps, temperature control valves. *Trane Co., Dept. HPAC, La Crosse, Wis.*

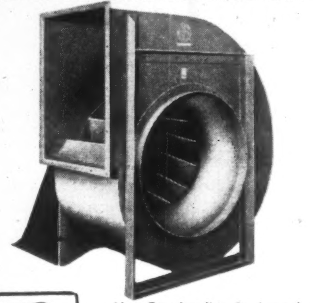
▶ *UNIT HEATERS*—Line of horizontal unit heaters covered in catalog No. 2557. Literature gives performance data, wiring and piping diagrams, construction features, architects' specifications. Information included on proper mounting heights, air throw. *Young Radiator Co., Dept. HPAC, Racine, Wis.*

▶ *V-BELTS*—Tips on how to obtain longer v-belt life contained in 12 page bulletin 20X6234C. Literature describes various types of v-belts, tells how to select and match them. Lists seven steps for correct installation. *Allis-Chalmers Mfg. Co., Dept. HPAC, 1171 S. 70th St., Milwaukee.*

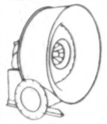
▶ *VALVES*—Bronze and steel valves presented in new 80 page catalog. Designs include globe, angle, gate, flow control, other types applicable to power, petroleum, chemical, general industry installations. Literature includes engineering data such as material specifications, flow charts, temperature and pressure ratings. *Manning, Maxwell & Moore, Inc., Dept. HPAC, Stratford, Conn.*

GENERAL BLOWER EQUIPMENT INSTALLED IN *NEW* Caterpillar PLANT

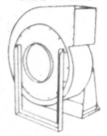
CATERPILLAR'S GIANT DECATUR, ILL. PLANT



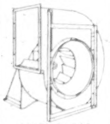
Non-Overloading Backward Blade Centrifugal Fan for Heating, Ventilating, Air Conditioning



TURBO BLOWERS



INDUSTRIAL FANS



CENTRIFUGAL FANS
BACKWARD BLADE
FORWARD CURVE

GENERAL BLOWERS ARE CUSTOM ENGINEERED

In 1950 Caterpillar Tractor Co. bought 32 No. 6 DIDW General Blower Co. fans for their new Joliet, Ill. plant. The fans operated so successfully over a four and one half year period that Caterpillar installed 27 General blowers in their huge Decatur, Ill. plant. These fans move 1,220,000 CFM and fully meet all official ventilating requirements.

General Blower Co. manufactures a complete line of air moving equipment for heating, air conditioning, ventilating, industrial, and power plant applications.

AMERICA BREATHES EASIER WITH "Lungs for Industry"

GENERAL BLOWER COMPANY
8601 FERRIS AVE., MORTON GROVE, ILL.

La Fonda

PARKFRONT APARTMENTS

AIRTEMP keeps the 354 units of Houston's La Fonda development cool, even in Texas' hottest weather. Equipment: three packaged chilled-water systems which total 390 tons capacity. *Consulting Engineer:* O. E. Winter. *Builder:* Winter-Mallette Building Company. *Architect:* Joseph D. Reynolds.

2-Bedroom Apartments

EASILY RENTED for $135⁰⁰

when air-conditioned with Chrysler's Airtemp at La Fonda development

Chrysler's advanced engineering

makes air conditioning practical

for every building project!

EASY TO INSTALL—*world's largest selection of models!*

100 Years of Progress

THE AMERICAN INSTITUTE OF ARCHITECTS 1857 1957

Best wishes to the members of The American Institute of Architects, Inc. on the occasion of the AIA CENTENNIAL CELEBRATION CONVENTION, Washington, D. C., May 14-17, 1957.

CONSULT AN ARCHITECT • USE QUALITY PRODUCTS

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CONSTRUCTION
DIVISION OF
CHRYSLER CORPORATION

PHONE your nearby Airtemp outlet for details on the advantages of AIRTEMP Air Conditioning for *your* next project. Or write direct to Airtemp Construction Division, Chrysler Corporation, Dayton 1, Ohio.

AIR CONDITIONING AND HEATING FOR A HOME, A BUSINESS, AN AUTOMOBILE

This
modern
steel boiler
gets
more heat
from fuel

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FITZGIBBONS
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For detailed information
about this steel boiler -
catalog sheets, brochures, and
specifications - write today
to the Fitzgibbons Boiler
Company, address below.

The Fitzgibbons "R-Z-U" Jr.®

**engineered specifically for
the larger residence and the smaller
commercial or public building.**

Compact in size but big in performance. The "R–Z–U" Junior Steel Boiler burns oil, gas or coal – no matter which fuel, the "R–Z–U" Junior captures more of the heat and efficiently turns it into Btu's. Savings in fuel up to 25% are possible with this Fitzgibbons' design.

Installation is easy because the boiler is extremely compact. It can be located close to the chimney, since all cleaning and maintenance can be performed from the front through large gas-tight flue and fire doors.

Domestic hot water supply for any purpose is constantly and effectively furnished through the famous Fitzgibbons "Tanksaver"® – a finned, copper coil submerged in the boiler where the water is the hottest.

Install the Fitzgibbons "R–Z–U" Junior – a product of almost three-quarters of a century of good steel boiler design and construction – for a lifetime of low cost heating comfort for your customers.

Fitzgibbons
Boiler Company, Inc.
101 PARK AVENUE, NEW YORK 17, N. Y.
DEPT. 20

SINCE 1886
MOST ECONOMICAL IN FUEL
1886
THE FITZGIBBONS BOILER

FB-117

RECENT TRADE LITERATURE
Continued

▶ *VERTICAL PRESSURE FILTERS*—Publication 6321 describes company's standard type "C" vertical pressure filters for commercial buildings, institutions, small industrial plants. Furnishes details of operation, available sizes, filtering capacity. *Cochrane Corp., Dept. HPAC, 17th St. below Allegheny Ave., Philadelphia 32.*

▶ *WATER CONDITIONING*—Technical reprint T-153, 7 pages, discusses role that demineralizer subfill plays in reducing costs of operation of a demineralizing system. *Graver Water Conditioning Co., Dept. HPAC, 216 W. 14th St., New York.*

▶ *WATER HEATERS*—Data file 16 covers company's line of copper lined storage water heaters for industrial, commercial applications. Included are: diagram of construction details and recommended minimum specifications; 8 page tabular section of dimensions, heating capacities, engineering data; installation suggestions and piping arrangements; case histories of typical installations. *Patterson-Kelley Co., Dept. HPAC, East Stroudsburg, Pa.*

▶ *WATER HEATERS*—Specification of 17 models of commercial gas water heaters detailed in 8 page catalog. Booklet covers units in three use classifications of AGA—automatic storage gas water heaters, circulating tank gas water heaters, instantaneous gas water heaters. Sizing tables show Btu input, hot water delivery at graduated temperature rises, installation space requirements. *Ruud Mfg. Co., Dept. HPAC, Kalamazoo, Mich.*

▶ *WATER TREATMENT*—Literature on treatment of water in air conditioning systems includes hints on corrosion and scale prevention; problems in chilled water circulating systems, refrigerating plants; control of chemical treatment. *Water Service Laboratories, Inc., Dept. HPAC, 423 W. 126th St., New York 27.* ‡

WHO'S WHAT . . .

(New personnel, promotions)

▸ *BABCOCK & WILCOX CO.*—M. Nielsen, president. For the past two years executive vice president of the company, he succeeds Alfred Iddles, retiring.

▸ *WALWORTH CO.*—John C. Wallace, vice president of engineering; George E. McDonald, vice president and treasurer; Frederick M. Jackson, vice president in charge of sales. Ardon B. Judd has been elected president of Southwest Fabricating & Welding Co., a subsidiary. Fred W. Betz, Walworth president, becomes chairman of the board of Southwest.

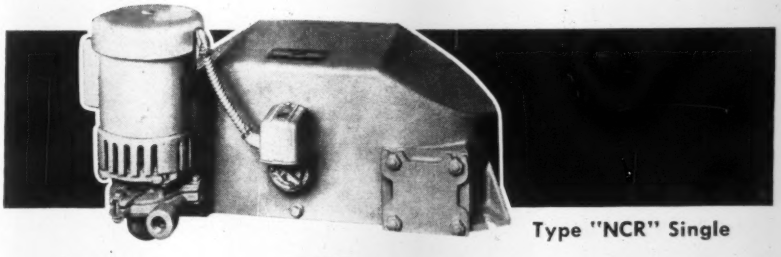
▸ *BRUNDAGE CO.*—Homer F. Brundage, chairman of the board of directors; Ward Brundage, president; J. E. Brundage, vice president and secretary; C. W. Becker, treasurer and controller.

▸ *JOHNSON SERVICE CO.*—Norman Janisse, director of heating and air conditioning division of Instrument Society of America.

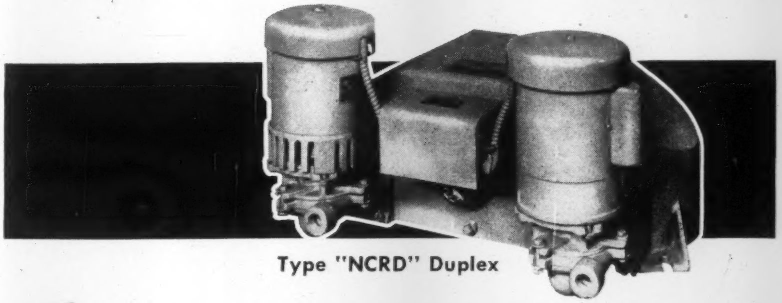
▸ *COOLING TOWER INSTITUTE*—Officers for 1957 are: Paul R. Hoffmann, president of Lilie-Hoffmann Cooling Towers, Inc., president; Karl E. Johnson, vice president and general manager of J. F. Pritchard & Co. of California, vice president; Denis E. O'Neil, manager of cooling tower department of Foster Wheeler Corp., secretary; Forrest B. Reed, manager of sales for Marley Co., treasurer.

▸ *BABCOCK & WILCOX CO.*—Edward Gerstenschlager, manager of production engineering of company's boiler division.

▸ *HYDRAULIC INSTITUTE*—Noble Dean, Jr., vice president and treasurer of Dean Bros. Pumps, Inc., president; Wayne Staley, vice president of sales for Duriron Co., vice president.



Type "NCR" Single



Type "NCRD" Duplex

7 Important Advantages in WHEELER-ECONOMY Condensate Return Pumps

For ratings up to 8,000 Sq. Ft. E.D.R. at 50 psi

1. Close-Coupled Pump with Mechanical Seal • Pump flanged directly to receiver • Water flows from tank to pump without passing through any piping.
2. Low Inlet • Only 7½" above floor • Simplifies installation • Keeps piping out of way.
3. Single Unit can be converted to Duplex Unit • Simply remove blind flange and add a pump, motor and mechanical alternator.
4. Float Control features External Adjustment for limiting operational levels of condensate within receiver.
5. Single Unit is operated by a float switch. Duplex Unit features a mechanical alternator which alternates operation of pumps, provides emergency operation of one pump should the other be inoperable and simultaneous operation of both pumps under peak flow conditions.
6. Easily Serviced • Can be taken apart quickly without disturbing pipe connections.
7. Self-Venting • Oversize Suction inlet permits pump to handle condensate at 200° F without vapor locking.

40 YEARS REPUTATION

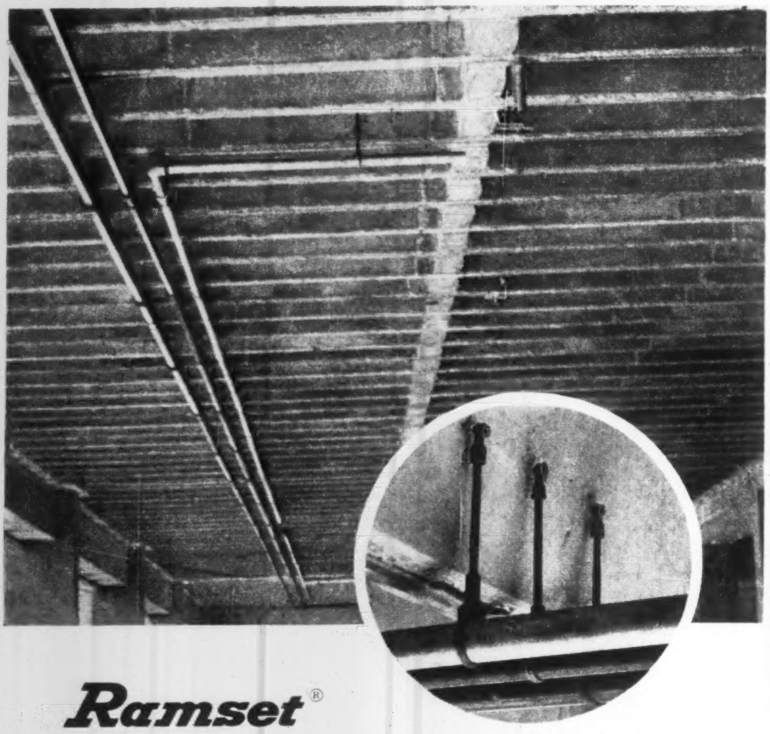
Today's Wheeler-Economy Heating System Pumps are backed by 40 years of high performance in thousands of installations.

Write for Catalog H-1.

C. H. WHEELER MANUFACTURING CO., ECONOMY PUMP DIVISION
19th & Lehigh, Philadelphia 32, Pa.

WE 700

C.H. Wheeler
OF PHILADELPHIA



Ramset®

makes PIPE HANGING fast and easy

Long and difficult pipe runs in steel and concrete are hung much easier with RAMSET. Just a squeeze of the trigger and the hanger is anchored properly, permanently. No pre-set bolts, no entangling wires, no drilling, chipping or plugging.

RAMSET is especially valuable for ladder and scaffold work because of its simple, lightweight, one hand operation. Nothing extra to carry or drag—the power's in your pocket. Puts the fastener where you want it, when you want it and how you want it!

Trade tool for the plumbing industry, RAMSET will anchor to concrete, steel, other hard materials and hold better than old-style methods.

New pocket guide shows exactly which fastener and charge will do your application best. Ask for your free copy, ready now!

It's worth finding your RAMSET dealer in the yellow pages of your phone book, listed under "Tools".

Ramset
DUO-JOBMASTER
sets ¼" and ⅜" fasteners interchangeably, or use
SUPER-POWER JOBMASTER
for extra heavy-duty work.

Ramset Fastening System
WINCHESTER-WESTERN DIVISION
OLIN MATHIESON CHEMICAL CORPORATION

12109-E BEREA ROAD • CLEVELAND 11, OHIO

WHO'S WHAT

Continued

▶ *BELL & GOSSETT CO.*—W. A. Boone, vice president in charge of sales; A. B. Meeg, sales manager.

▶ *CARRIER CORP.*—Keith S. McHugh, a director. Promotions within company's Unitary Equipment Div. are: Russell Knowles, distribution services manager; Floyd A. Flesher, materials manager; Thorston Nordquist, general superintendent.

▶ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—Albert R. Kaspark, manager of technical sales; James C. Cameron, manager of market research; Sam E. Robb, advertising supervisor; P. J. Petropoulos, account manager of newly combined air conditioning and refrigeration and standard products accounts in company's Harrison, N.J., plant advertising and sales promotion; F. A. Paine and H. J. Newbauer, account supervisors of air conditioning and refrigeration products promotion.

▶ *FUEL OIL & WATER HEATER MANUFACTURERS' ASSOCIATION*—Officers for 1957 are: Charles E. Drake of Patterson-Kelley, Inc., president; Walter Veit of Manning & Lewis Engineering Co., vice president; William B. Gorey of Adsco Industries, Inc., secretary.

▶ *GENERAL ELECTRIC CO.*—L. H. Drayton, manager, advertising and sales promotion, "Weathertron" department.

▶ *HAYS CORP.*—Paul H. Krueger, manager of manufacturing.

▶ *McQUAY, INC.*—Kenneth R. Lundberg, general sales manager.

▶ *BJORKSTEN RESEARCH LABORATORIES FOR INDUSTRY, INC.*—James E. Henning, vice president; Irvin Leichtle, administrative assistant.

WHO'S WHAT

Continued

▶ *ARMSTRONG CORK CO.*—R. L. Collister, manager of equipment insulation sales of insulation division. He succeeds L. E. Cover, retired.

▶ *JOSEPH T. RYERSON & SON, INC.*—Robert L. Larson, general manager of Indianapolis plant now under construction. At firm's general offices in Chicago: Jack R. Freiday, manager, traffic contracts; Glen H. Reno, manager, traffic rates and claims. At south warehouse of Chicago plant: Randall E. Campbell, superintendent of operations; Walter K. Johnson, superintendent in structural fabricating shop.

▶ *INTERNATIONAL BOILER WORKS CO.*—Georg Stabenow, vice president in charge of engineering.

▶ *FARR CO.*—E. L. Williams, advertising and sales promotion manager.

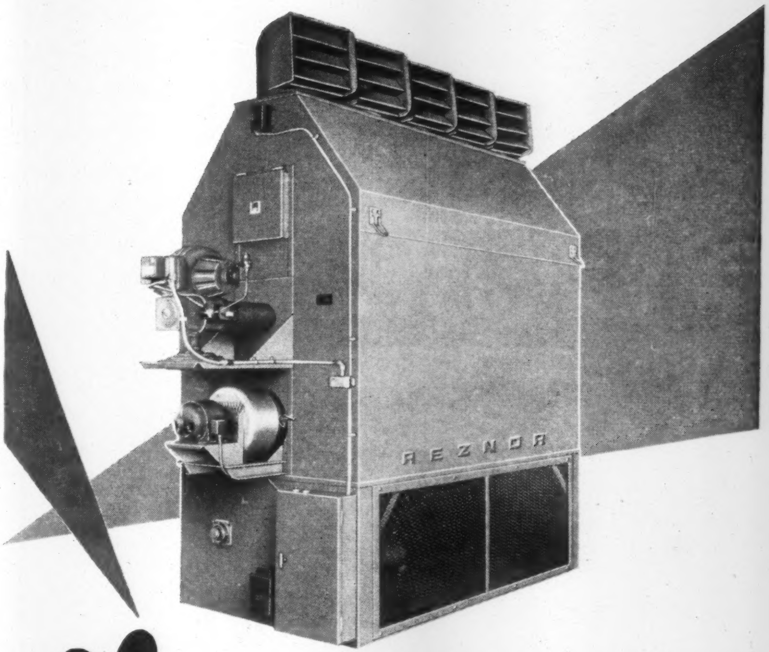
▶ *DEMING CO.*—Glenn L. Davis, chief engineer; Eugene T. Brooks, assistant chief engineer; Louis C. Ospeck, chief design engineer.

▶ *WARNER ELECTRIC BRAKE & CLUTCH CO.*—Industrial division appointments are: Wesley Timmcke, manager of engineering; Roger H. Brown, sales manager.

▶ *DOLE VALVE CO.*—John J. Goodwillie and James K. Lund, vice presidents; John A. Kovas, S. G. Eskin and Elmer A. Skowbo, assistant vice presidents.

▶ *CENTURY ENGINEERING CORP.*—F. G. Johnson, sales manager of heating and air conditioning division.

▶ *MIDCONTINENT TUBE SERVICE, INC.*—Harold Michel and Cyril M. Rappaport, appointed to executive staff of the Evanston, Ill., distributor and warehouser of carbon and alloy steel pipe and tubing.



Olson Stainless Steel Direct-Fired Heaters

Now a part of the Reznor line

Reznor, the leader in gas unit heating, has taken over the manufacture of Olson stainless steel direct-fired heaters. They will now be marketed as Reznor-Olson heaters. These units, formerly made by Arthur A. Olson & Company of Canfield, Ohio, have been widely recognized for their superior engineering.

Continuity of engineering has been assured by the addition of key personnel from the Olson organization to the Reznor staff. Further development and improvement of the line will be continued with Reznor research and engineering facilities under the direction of Olson men who pioneered this type of equipment. Production of the heaters will be integrated into the Reznor manufacturing operation. This will mean better delivery schedules. And the extensive Reznor field organization will mean improved availability of product information and engineering assistance when you need it.

If you're not familiar with Olson equipment, write today for free descriptive bulletin.

REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED
UNIT HEATERS

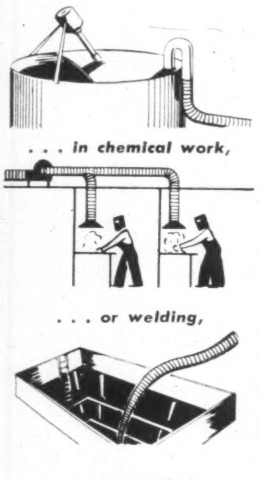
Reznor Manufacturing Company, Dept. H, Mercer, Pa.

POSITIVE

FUME CONTROL

FLEXAUST® HOSE

is the answer!



It doesn't really make any difference *what* the application is . . . . Flexaust is ready and able to perform it easily and economically.
Made of strong neoprene coated cotton or nylon fabrics spiral wire reinforced.
For *all* kinds of fume and dust control, and ventilation uses.
Extremely flexible, durable, and lightweight.
Exceptionally easy to cut, install, connect, reuse, and relocate.
Please write us today for details.

Sizes 1¼" to 36" ID

THE FLEXAUST COMPANY
Dept. HP-5
100 PARK AVENUE NEW YORK 17, N.Y.

AEROMASTER fans 54" to 22' for cooling towers and radiator-type coolers.

NEW Metal Blade Aeromaster* Fan

Lasts Longer • Costs Less

Efficiency . . . economy . . . durability—three important standards—are yours in the AEROMASTER fan.

AEROMASTER fans are efficient because they embody advanced aerodynamic principles. True airfoil blade sections give maximum air delivery.

AEROMASTER fans are economical because adjustable pitch angle of the blade permits a flexibility of setting which enables you to decrease fan load to an accurate minimum horse-power requirement. Design features reduce labor and installation costs.

AEROMASTER fans are durable because they are made from corrosion resisting, silicon-magnesium, aluminum alloys with high tensile strength, fine grain structure and increased endurance limit.

For more details write to KOPPERS COMPANY, INC., Aeromaster Fan Dept., 6805 Scott Street, Baltimore 3, Md.

*Koppers Trademark

KOPPERS

Aeromaster Fans
Engineered Products Sold with Service

WHO'S WHAT

Continued

▶ *SEELYE STEVENSON VALUE & KNECHT*—William T. Cleland, Jack N. Keck and Alexander Michelson, Jr., associates of the firm. All are members of the consulting engineering company's mechanical and electrical engineering division.

▶ *BURNHAM CORP.*—John W. Murray, Jr., general sales manager of boiler division.

▶ *CHASE BRASS & COPPER CO.*—Leland S. Hanson, executive sales director.

▶ *WESTINGHOUSE ELECTRIC CORP.*—H. C. McDaniel, director of technical information; Robert V. McGahey, manager of technical publicity. John F. Myers, vice president of Westinghouse, has been appointed manager of the company's marketing subsidiary, Westinghouse Electric Supply Co.

▶ *JOHNS-MANVILLE CORP.*—Reginald L. Johnson, vice president. In his new post, Mr. Johnson will head up advertising and sales promotion activities as sales promotion manager.

▶ *PENNSYLVANIA SALT MFG. CO.*—Fred Koelble, staff assistant for corrosion engineering products department.

▶ *FLEXONICS CORP.*—James L. Cullen, assistant sales manager of hose division.

▶ *OLIN MATHIESON CHEMICAL CORP.*—Carl R. Rowe, plants manager of rolling mill at Omal, Ohio.

▶ *CONTROLS CO. OF AMERICA*—Harry Welch, advertising manager.

▶ *CARRIER CORP.*—Leslie Meikleham, chief purchasing agent of Unitary Equipment Div.

WHO'S WHAT

Continued

▶ *INTERNATIONAL NICKEL CO., INC.*—Maurice J. Phillips, advertising manager.

▶ *MULT-A-FRAME DIV., AINSWORTH MFG. CORP.*—W. J. Rashleigh, general manager.

▶ *PITTSBURGH PLATE GLASS CO.*—Turrell Uleman, director of newly established market research department.

▶ *A. M. BYERS CO.*—Daniel A. Torisky, appointed to advertising department.

▶ *YORK CORP.*—J. V. Clippinger, manager of accessory equipment and maintenance sales for industrial division.

▶ *OIL-HEAT INSTITUTE OF AMERICA, INC.*—Frank R. Brophy, chairman of new publicity committee. Mr. Brophy is manager of advertising and sales promotion, boiler division of Burnham Corp. Members of the committee are: T. R. Loizeaux, president of T. R. Loizeaux Fuel Co.; G. M. Marin, president of Sun-Ray Burner Mfg. Co.; D. C. Patten, president of J. V. Patten Co.; Charles Rapiport, general sales manager for Union Electric & Mfg. Co.

▶ *TRANE CO.*—James Whalen, head of transportation sales section; Kenneth Shannon, assistant to Mr. Whalen; L. E. Daniel, convector manager, replacing Mr. Whalen.

▶ *ELECTRO DYNAMIC DIV., GENERAL DYNAMICS CORP.*—William R. Van Dusen, manager of personnel department.

▶ *HOOKER CHEMICALS, LTD.*—John W. Dobbie and C. Newton Hopkins, technical supervisor and chemical engineer, respectively.

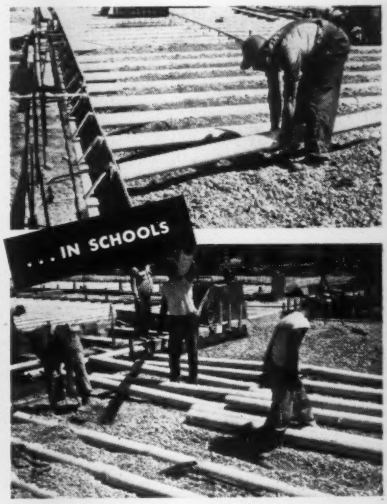
▶ *KEYSTONE BRASS WORKS*—George Dublin, sales manager of brass division.

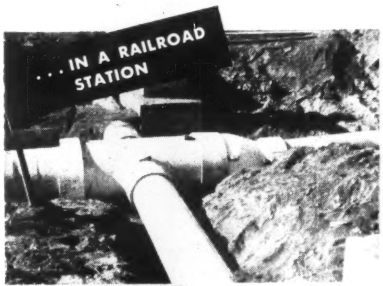
▶ *DUREZ PLASTICS DIV., HOOKER ELECTROCHEMICAL CO.*—Dr. Jay C. Searer, works manager.

▶ *AMERICAN RADIATOR & STANDARD SANITARY CORP.*—Warren Campbell, supervisor of air conditioning division heating and air conditioning school.

For in-slab warm air systems...

Transite* Air Duct is specified for trouble-free service





. . . IN A HEALTH CENTER

. . . IN A LIFE INSURANCE BUILDING
. . . AND IN HOMES, OF COURSE

Transite Air Duct is easily installed. Its joints are assembled quickly, simply. It never needs anchoring. It easily withstands rough handling and impact of poured concrete. Transite Air Duct resists corrosion. Made of asbestos-cement, Transite's corrosion resistance and long trouble-free life are a matter of record. And, it is priced for competitive bidding. Write today for further information: Address Johns-Manville, Box 14, New York 16, New York. (In Canada, Port Credit, Ontario.)

*Transite is a Johns-Manville registered trademark

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE AIR DUCT

an asbestos-cement product

A COLD LINE is only as good as its cover

Available in standard pipe sizes and fittings in three thicknesses; Light, (Ice Water to 30° F.) Medium, (Brine and Ammonia to 0° F.) Heavy, (Heavy Brine—25° F. and lower.)

UNITED CORK PIPE COVERING
THE IDEAL COLD LINE INSULATOR

A cold line system is only as effective as its insulation. Inferior pipe covering in just one section of the line will cause operating costs to skyrocket and a considerable loss in dollars to the cold storage operator. United's pipe covering gives you the best insulation with all these advantages:

Extremely low "K" factor
Retains over 80% of cold loss on piping
Easy and economical to install
Long trouble-free life
Fire retardant—Vermin resistant
No capillarity

LARGER STOCKS—FASTER DELIVERY—PERSONAL SERVICE

United Pipe Coverings are available from stock for prompt delivery—to fulfill your immediate installation requirements. Mail the coupon below for additional information or the name of the United distributor nearest you.

Corkboard Pipe Covering Tank Lagging

UNITED BB CORKBOARD (BLOCK BAKED) Patented

Manufacturers of cork insulation for almost a half century

UNITED CORK COMPANIES
1 Central Ave., Kearny, New Jersey

UNITED CORK COMPANIES, 1 Central Ave., Kearny, N.J.
Please send United Cork Catalog. I am interested in
NAME
FIRM
ADDRESS
CITY ZONE STATE

Engineering offices, or approved distributors, in key cities—coast to coast.

WHO'S WHAT

Continued

▶ *PENDLETON TOOL INDUSTRIES, INC.*—Frank E. Hutton, director of research and development; Louis Greenfield, assistant general sales manager; Nelson Bartoo, director of contract sales. Appointments for Proto Tool Co., a division, are: Richard E. Reich, product sales manager; Henry J. Zellweger, advertising and sales promotion manager.

▶ *AMERICAN STEEL BAND CO.*—J. H. Bowman, Jr., vice president, sales; H. B. Bowman, vice president, operations; N. R. Hettman, general manager of sales; M. A. Gore, sales manager, ventilators; C. Glockler, inside ventilator sales.

▶ *ELECTRIC FURNACE-MAN, INC.*—Norwood Allender, assistant to sales manager.

▶ *OLIN REVERE METALS CORP.*—Troy B. Hunt, plant manager of reduction plant at Omal, Ohio.

▶ *FLORI PIPE CO.*—Kenneth R. Notvest, chief research engineer; J. F. Huitt, chief engineer; Roy W. Reierson, vice president and general manager of Houston plant; Dwight Ketring, plant manager of St. Louis works.

▶ *WHIRLPOOL-SEEGER CORP.*—Otto Krauss, director of manufacturing research; Glenn A. Evans, general manager of St. Joseph, Mich., division; Jasper F. Burt, general manager of Marion, Ohio, division; S. J. Smith, LaPorte, Ind., division plant manager.

▶ *MITCHELL MFG. CO.*—Walter Zale, advertising manager.

▶ *HANDY & HARMAN*—Charles D. Coxe, manager, metallurgical department.

▶ *DEMING CO.*—John Klein, assistant sales manager.

WHO'S WHAT

Continued

IN THE TERRITORIES . . .

(Recent sales appointments)

▸ *YORK CORP.*—J. Wesley Floreth, manager, midwest district. The district is comprised of Missouri, Kansas, Colorado, Nebraska, Iowa, Oklahoma, Arkansas, Idaho, South Dakota, Utah, Wyoming, parts of Illinois, Kentucky, Mississippi, Montana, Nevada, Arizona, New Mexico and Tennessee. Mr. Floreth was manager, industrial refrigeration sales, at company headquarters in York, Pa.

▸ *WHEELCO INSTRUMENTS DIV., BARBER-COLMAN CO.*—Harold Dirkers, branch manager of St. Louis office; Howard Berger, Cleveland office manager; Norman H. Fertig, assigned to Cleveland service staff; Stanley Hanson, manager of Detroit branch; George Hall, sales engineer at Detroit; Louis D. Gercken, assigned to Atlanta sales engineering staff; Hyman Hacker and Shelton Cashbaugh, Los Angeles sales engineers; Robert B. Sanquist, Los Angeles service engineer; Joseph S. McDonnel and John M. Schneider, sales engineers at Philadelphia; Henry L. Byrne, Philadelphia sales engineer; William C. England, service engineer at Pittsburgh office; Kenneth J. Munhall, Pittsburgh sales engineer; Herman J. Schneider, Edward J. Pasch and Roger S. Williams, assigned to application engineering group at Rockford, Ill. Wheelco has established a new branch office at Springfield, Ill., with LeRoy Peterson named branch sales manager. Changes of address of the company's branches include: Indianapolis, relocated to 1953 Central Ave.; Buffalo, moved to 2534 Elmwood Ave.; Rock Island, Ill., to 3710 14th Ave.; St. Louis, to 2344 Hampton Ave.

▸ *AMERICAN RADIATOR & STANDARD SANITARY CORP.*—For plumbing and heating division: Brendan P. O'Connell, manager of newly established Philadelphia district sales office; Gerhardt D. Bruggemann, Jr., manager of Milwaukee office.

▸ *NATIONAL SUPPLY CO.*—Recently named assistant district managers are: Richard S. Skinner, Philadelphia; J. Huston Lobingier, Houston.

▸ *CARRIER CORP.*—Marco Sales, Inc., distributor for Unitary Equipment Div. in St. Louis metropolitan area, southern Illinois, eastern Missouri.

▸ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—John V. Betz, New York area sales representative; William Bothwell, a similar appointment covering Kentucky, southern Indiana.

Make

BARRY

BLOWER COMPANY

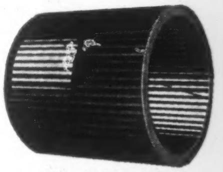
your dependable low cost source of supply for

POWER FAN EQUIPMENT

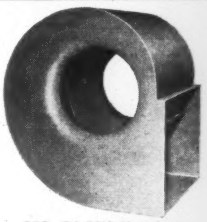
We offer users of power fan equipment a full line of blowers, multiple blower assemblies, direct and belt driven ventilating sets, cast iron blowers and various types of centrifugal blower wheels and housings. All sizes from 6" to 73".

ALL BARRY blower wheels and housings are precision made from steel, aluminum, brass, copper or stainless, and are expertly balanced and trued before shipment.

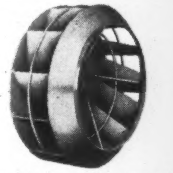
We make power fan equipment *exclusively*, and do not compete with our own customers . . . . . and, we have a high reputation for dependable quality and remarkably fast deliveries. Let us quote on our standard equipment, or upon your special sizes and specifications. Write us today.



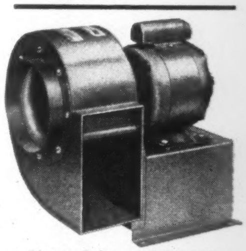
BFC, DI-DW Wheel



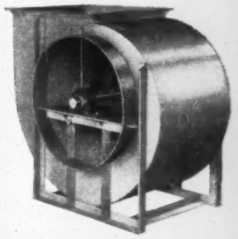
BFC, DI-DW Housing



BBI Blower Wheel SI-SW. Class 2.



Direct Drive, All-Purpose Utility Blower



BBI Blower, SI-SW Arrangement No. 3, class 4

REPRESENTATIVES

A few territories available for sales representatives

BARRY BLOWER COMPANY

3100 California Street N.E. • Minneapolis 18, Minnesota

WHO'S WHAT

Continued

▶ *KRITZER RADIANT COILS, INC.*—Hurston-Conaway, Inc., representative for Memphis, Nashville, Little Rock.

▶ *WESTINGHOUSE ELECTRIC CORP.*—Perry E. Davis, manager of new Cleveland factory branch for air conditioning division; Neal T. O'Rourke & Assoc., Buffalo distributor for Sturtevant Div.

▶ *FAIRBANKS CO.*—Sheldon H. Ingram, manager of Pittsburgh branch office and warehouse.

▶ *MODINE MFG. CO.*—Associated Thermal Products, Inc., New York representative for company's heating and air conditioning division.

▶ *TRANE CO.*—Package equipment sales engineers added to field sales staff are: Richard N. Shelby, Cincinnati; Ralph L. Lancaster, New Orleans.

▶ *BRUNNER DIV., DUNHAM-BUSH, INC.*—Authorized wholesalers and areas they will serve are: Arrow-Risco, Inc. of North Hollywood Calif., with headquarters in Los Angeles; W. A. Case & Son, Plattsburgh, Newburgh, Albany and Binghamton, N.Y.; Refrigeration Supplies Distributor of Riverside, Calif., with branches in Bakersfield and Los Angeles; Refrigeration Supplies Distributor, Las Vegas, Nev., San Diego, Los Angeles and El Centro, Calif.; Noland Co., Jacksonville; Paine Supply Corp., Tupelo, Miss.; Thermal Products, Inc., Fresno, Calif.; O'Brian Associates, Miami; Leinart Engineering Co., Knoxville; Graves Broward Co., Ft. Lauderdale, Fla.; Capital Refrigeration Supply, Inc., Tallahassee, Fla.; Mote W. Baird & Son, St. Petersburg, Fla.; William Wurzbach Co., Oakland; Pioneer Supply Co., Burlington, Ia.; A & H Supply Co., Dayton; Graves Bros. Refrigeration Suppliers, St. Petersburg; Knoxville Refrigeration Supply Co., Knoxville.

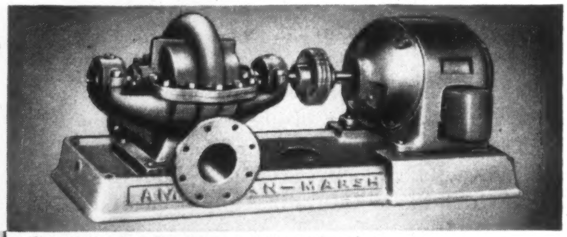
▶ *BINKS MFG. CO.*—William R. Funk Co., representative in Philadelphia area for company's cooling tower line. The area includes Wilmington, Atlantic City, Trenton and Harrisburg.

▶ *NATIONAL-U.S. RADIATOR CORP.*—John W. Arnold and Dayton L. Bergman, managers of Pittsburgh and Kansas City, Mo., branches, respectively.

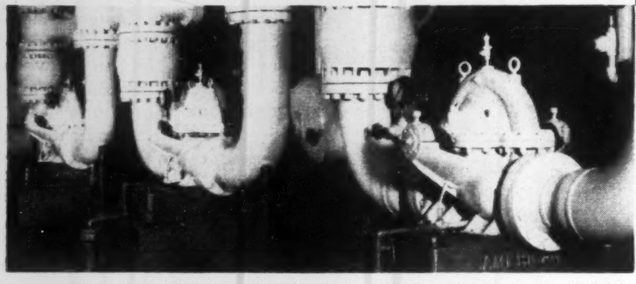
▶ *U.S. GAUGE, DIV. OF AMERICAN MACHINE AND METALS, INC.*—William H. Bolton, in charge of new office at Dallas. Added to other offices are:

Install American-Marsh

PUMPS LIKE THIS



Conventional stuffing box or mechanical seals.



Above — Three bronze-fitted American-Marsh Centrifugals, with direct drive 150 HP motors, each circulate up to 2,000 GPM of chilled water in air-conditioning system.

on vital heavy-duty

JOBS LIKE THIS

FOR PERMANENT SATISFACTION!

WHEN YOU SELECT or recommend an American-Marsh Pump, you know it's backed by 80 years' experience in building pumps — and pumps only! WHEN YOU INSTALL it, you know it was individually factory tested to meet all specifications before shipment. (*Every* A-M pump is fully tested!) IF YOU'D LIKE suggestions on the best type and size for *your* job, call your American-Marsh representative. He'll help make sure *your* pump gives permanent satisfaction!

WRITE FOR BULLETIN 350 for details of Model HLM above — or describe your application.

AMERICAN-MARSH PUMPS

BATTLE CREEK MICHIGAN

In Canada:
American-Marsh Pumps (Canada) Ltd., Stratford, Ont.

CENTRIFUGAL, TURBINE, STEAM AND POWER PUMPS FOR TESTING, PROCESSING, BOILER FEED, FIRE PROTECTION, ETC.

WHO'S WHAT *Continued*

Donald Zook, Houston; L. R. Muha, Chicago; R. W. McWatters, Cleveland; C. F. David, Los Angeles; J. H. Moore, Sellersville, Pa.

▶ *YORK CORP.*—J. W. Gerrard, St. Louis branch manager.

▶ *BABCOCK & WILCOX CO.*—William Lehr, manager of tubular products division's new district sales office in Atlanta. The office serves Georgia, the Carolinas, Alabama, Florida, southeastern Tennessee.

▶ *FARR CO.*—Fred Richardson, southern division sales manager; Ken DeBaun, eastern division sales manager; Ken Baker, sales engineer in charge of Washington, D.C., office; Andrew Gourley, western division sales manager.

▶ *RESEARCH PRODUCTS CORP.*—Doug Rippe, district salesman for southern Texas, Louisiana, Mississippi.

▶ *GENERAL CONTROLS CO.*—Stan Osborne, field representative for Los Angeles branch.

▶ *REMINGTON AIR CONDITIONING DIV., REMINGTON CORP.*—George J. Dunn, eastern sales manager.

▶ *AUTOMATIC DEVICES CO., INC.*—Donald F. Horan, manager of recently opened New York City office.

▶ *TUTHILL PUMP CO.*—M. J. McCaughey, regional sales manager of area composed of Wisconsin, northern Illinois, southern Iowa, Minnesota, eastern Missouri.

▶ *W-K-M DIV. OF ACF INDUSTRIES, INC.*—Wendell Grier, eastern sales representative for lubricated plug valve department. His territory includes eastern Pennsylvania, Delaware, Maryland, Virginia, southern New Jersey.

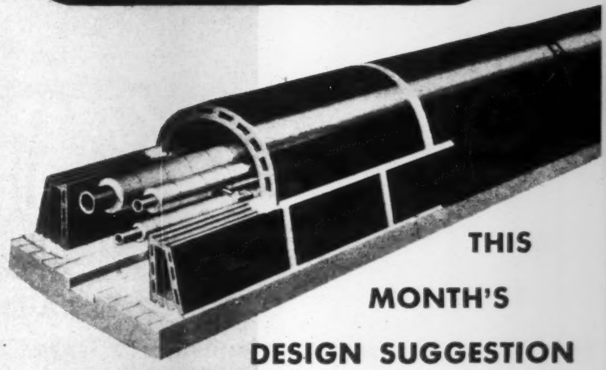
▶ *FRICK CO.*—John H. Carter, manager of St. Louis branch office.

▶ *DUNHAM-BUSH, INC.*—Recently appointed sales engineers and their territories are: George L. Jackson, Arizona; Al Lowey, San Leandro, Calif.; Keith E. Schneider, Dallas; Louis Nettleship, Oklahoma City;

Therm-O-Tile
REG. U.S. PAT. OFFICE

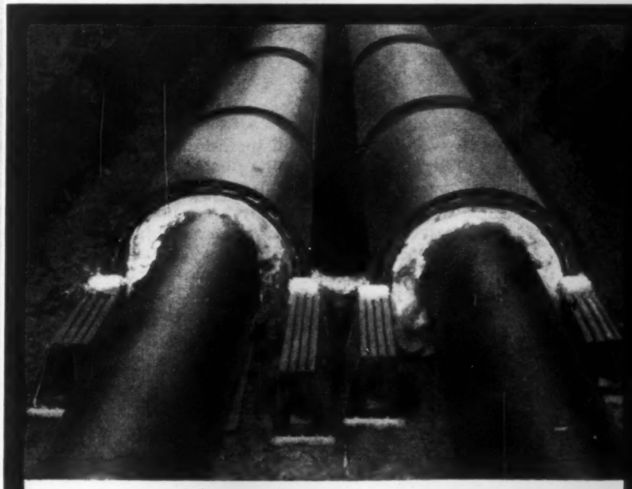
CONDUIT
FOR
UNDERGROUND
PIPING

• PERMANENT • ECONOMICAL
• SIMPLE • EFFICIENT



THIS
MONTH'S
DESIGN SUGGESTION

How to Take Care of
Large Multiple Pipes.



A Double Thermo-Tile Conduit for Multiple Pipes too Large for a Single Conduit.

FOR ADDITIONAL DESIGN DETAILS
AND GENERAL INFORMATION ASK FOR
Bulletin No. 9156

H. W. PORTER & CO., INC. • REID HAYDEN, INC.
822 Frelinghuysen Ave., Newark, N. J.
Baltimore, Md. Richmond, Va. Charlotte, N. C.
Insulation Engineers and Contractors

CORROSIVE GASES
CHEMICAL FUMES
DUST
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LIGHTWEIGHT PARTICLES
VAPORS
CELLOPHANE CUTTINGS
Quickdraft...

THE WORLD'S MOST EFFICIENT POWER EXHAUSTER

...for industry...for institutions...for residences

★ NO MOTORS, FANS OR BEARINGS IN EXHAUST LINE
★ NEEDS NO STACKS ★ ACID RESISTING VITREOUS ENAMEL FINISH

FOR INDUSTRY, Quickdraft excels in venting paint booths . . . abrasives . . . corrosive gases . . . noxious fumes . . . high temperatures and moisture. Its blower operates in clean or outside air. It eliminates down-time for cleaning and replacing fan blades. It improves industrial venting and reduces maintenance costs!

FOR INSTITUTIONAL AND COMMERCIAL BUILDINGS, Quickdraft efficiently vents heating plants, water heaters and incinerators at roof level. It saves the cost of building unsightly tall stacks.

FOR RESIDENCES, Quickdraft makes low, cold and erratic chimneys function. On and off with the fire, Quickdraft maintains constant draft required for efficient and economical combustion of all fuels. It eliminates pulsating or chattering, puffing, smoking and sooting.

SEND FOR QUICKDRAFT ENGINEERING DATA ON YOUR VENTING OR HEATING APPLICATIONS . . . TODAY.

Quickdraft COMPANY
P.O. Box 87-K Dueber-Hampden Bldg., Canton 1, Ohio

Capacities of 56 standard and heavy duty models (6 to 30 inches diameter) . . . 8,400 CFH to 1,005,960 CFH . . . greater capacities on special order.

N-434-QD
Quickdraft Company
P.O. Box 87-K Dueber-Hampden Bldg., Canton 1, Ohio
Please send Quickdraft engineering data for
☐ Industrial Exhausting
☐ Commercial Heating Plant
☐ Residential Heating Plant
Firm ____
Individual ____ Title ____
Street ____
City ____ Zone ____ State ____

WHO'S WHAT

Continued

Edward C. Blood, Kansas, southwestern Missouri; George A. Mansinger, Chicago; Jerry Wilcox, Salt Lake City; Jerry Howarth, northern California, western Nevada; Maxwell C. Finke, Chicago; Clifford Masek, Milwaukee; R. W. Bonin, Indianapolis; Al Rockafellow, Philadelphia; Peter Catalina, Baltimore; Robert K. Huber, Maryland; Jack Bower, Los Angeles; M. J. Phillipson, British Columbia, southwestern Canada.

▶ *SPANG-CHALFANT DIV., NATIONAL SUPPLY CO.*—Robert J. Casterton, district manager of New York office.

▶ *RAMSET FASTENING SYSTEM, OLIN MATHIESON CHEMICAL CORP.*—Graybar Electric Co., Inc., national distributor for "Shure-Set" hammer powered fastening tools.

▶ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—Howard J. Luetzow, technical sales representative in Chicago, surrounding area.

▶ *ARMSTRONG CORK CO.*—John J. Roper, assistant manager of insulation division's Boston district office.

▶ *CHASE BRASS & COPPER CO.*—Charles A. Festge, eastern regional sales manager; Edward J. Finn, Milwaukee district manager, succeeding Mr. Festge; G. C. Van Heusden, district manager of New York warehouse and office.

▶ *UTILITY APPLIANCE CORP.*—John L. Hall, manager of sales for southern California.

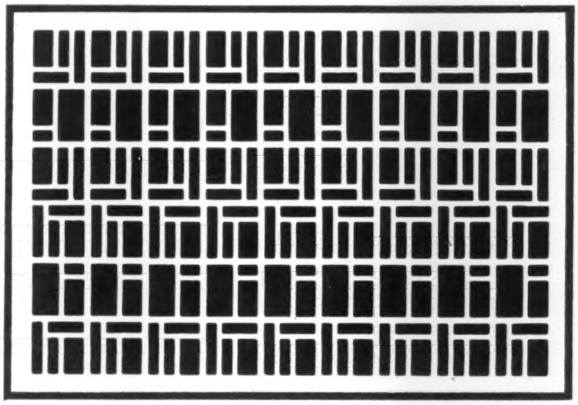
▶ *CURTIS MFG. CO.*—Dale Weitman, representative in Beloit, Wis., area.

▶ *AMERICAN BLOWER DIV. OF AMERICAN-STANDARD*—Richard C. Walsh, manager of new branch sales engineering office in Green Bay, Wis.

▶ *MARLO COIL CO.*—Friemel-Love Co., representative for St. Louis, eastern Missouri, southern Illinois.

▶ *U.S. GAUGE, DIV. OF AMERICAN MACHINE AND METALS, INC.*—Distributors for New York and Chicago areas, respectively, are: Truesdell Co., Newark, N. J.; Ray Welch Co., Hammond, Ind.

SIMPLE AS a b c!



a ARCHITECTS *specify*
b BUILDERS *approve*
c CONTRACTORS *buy*

. . . Hendrick grilles

Architects, Builders and Contractors all agree you can't beat Hendrick Architectural Grilles for overall attractiveness and functionalism! Hendrick Perforated Metal Grilles not only provide plenty of open area for the free passage of air, but they're easy to install — always lie flat, and can't bend or warp!

Over a hundred designs are available, many are exclusive only with Hendrick. Each design can be furnished in a wide range of dimensions, bar sizes, number and size of perforations. Write for details, today!

HENDRICK
MANUFACTURING COMPANY

48 DUNDAFF STREET CARBONDALE, PA.

Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Hendrick Wedge Wire Screens • Architectural Grilles Mitco Open Steel Flooring — Shur-Site Treads • Armorgrids Hydro Dehazers • Petrochemical Column Internals

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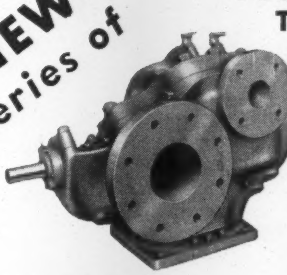
here's an ANGLE 45° *that generously* PAYS OFF

A NEW series of

AURORA® TYPE A



MULTI-PURPOSE PUMPS

two stage diagonally split case centrifugal

You will find that the diagonally split case offers substantial new advantages while retaining all of the best features of the horizontally split case pumps — in that the entire rotating element can be removed without disturbing piping — or — disturbing the pump-motor-base alignment. CONSIDER —

these PLUS BENEFITS

Suited to many applications, importantly BOILER FEED SERVICE as well as hot or volatile liquids duties.

•

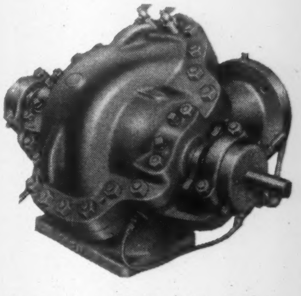
Low NPSH Characteristics

•

Being self-venting they WILL NOT VAPOR LOCK

•

45° split allows both suction and discharge to be in the bottom half of casing but above the center line of the pump.



Aurora Type AJ Centrifugal Pump with Water Cooled Bearings and Stuffing Boxes

STANDARD

These 45° diagonally split case pumps have, as standard, 125# A.S.A. Suction Flange and 250# A.S.A. Discharge Flange. Type AJ Pumps are usually Bronze-Fitted but can be furnished All-Iron or Stainless Steel trim for high temperature conditions.

WRITE FOR BULLETIN 106DS

Your Inquiries Will Receive Prompt Attention DISTRIBUTORS IN PRINCIPAL CITIES

AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY

80 LOUCKS STREET • AURORA • ILLINOIS
EXPORT DEPARTMENT—Aurora, Illinois—Cable Address "AURORAPUMP"

Petrometer
SERIES 1400
LIQUID DEPTH GAUGES

ACCURATE and EASY TO INSTALL

Available in 4 Models, Petrometer Series 1400 Tank Gauges operate on the sound principle of hydrostatic pressure. No moving parts, no expensive electrical or electronic equipment. Large vertical scale gives accurate, easy-to-see reading. And construction features make installation easy.

For complete information send for Bulletin 6004

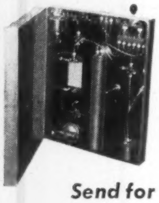
Petrometer

All Petrometer Gauges are guaranteed for one year

Measure Specific Gravity Accurately!

. . . and from a remote point

The Petrometer remote reading Specific Gravity Indicator is accurate to .001 Sp. G. unit, with interpolation to .0005 unit!
It's easy to install . . . and operates on the simple, sound principle of a differential bubbler.
An ideal instrument for plant or laboratory for measuring specific gravity of any liquid . . . paints, fuel, resins, pharmaceuticals, chemical solutions.
All functional parts are conveniently mounted on rear of panel, accessible by swinging open the cabinet door.



Send for Bulletin 7004

Petrometer
CORPORATION
43-22 TENTH STREET, LONG ISLAND CITY 1, N.Y.

WHO'S WHAT

Continued

▶ *JOHNSON SERVICE CO.*—James L. Best, manager of Detroit branch.

▶ *AMERICAN-STANDARD, AIR CONDITIONING DIV.*—Frank Hickey and Ted Bujewski, district representatives in Boston and Detroit territories, respectively.

▶ *TRANE CO.*—Field office assignments are: Roy J. Reeves, Washington, D.C.; A.J.L. Moritz, Gainesville, Fla.

▶ *POWERS REGULATOR CO.*—Jack B. Porter, manager of recently opened Richmond, Va., branch. The office serves the Richmond, Norfolk, southern Virginia area.

▶ *ALLIS-CHALMERS MFG. CO.*—Friemel-Love Co., distributor for motors and pumps in five western Illinois, four eastern Missouri counties.

▶ *ORR & SEMBOWER, INC.*—Paul E. O'Hora, New York district sales manager.

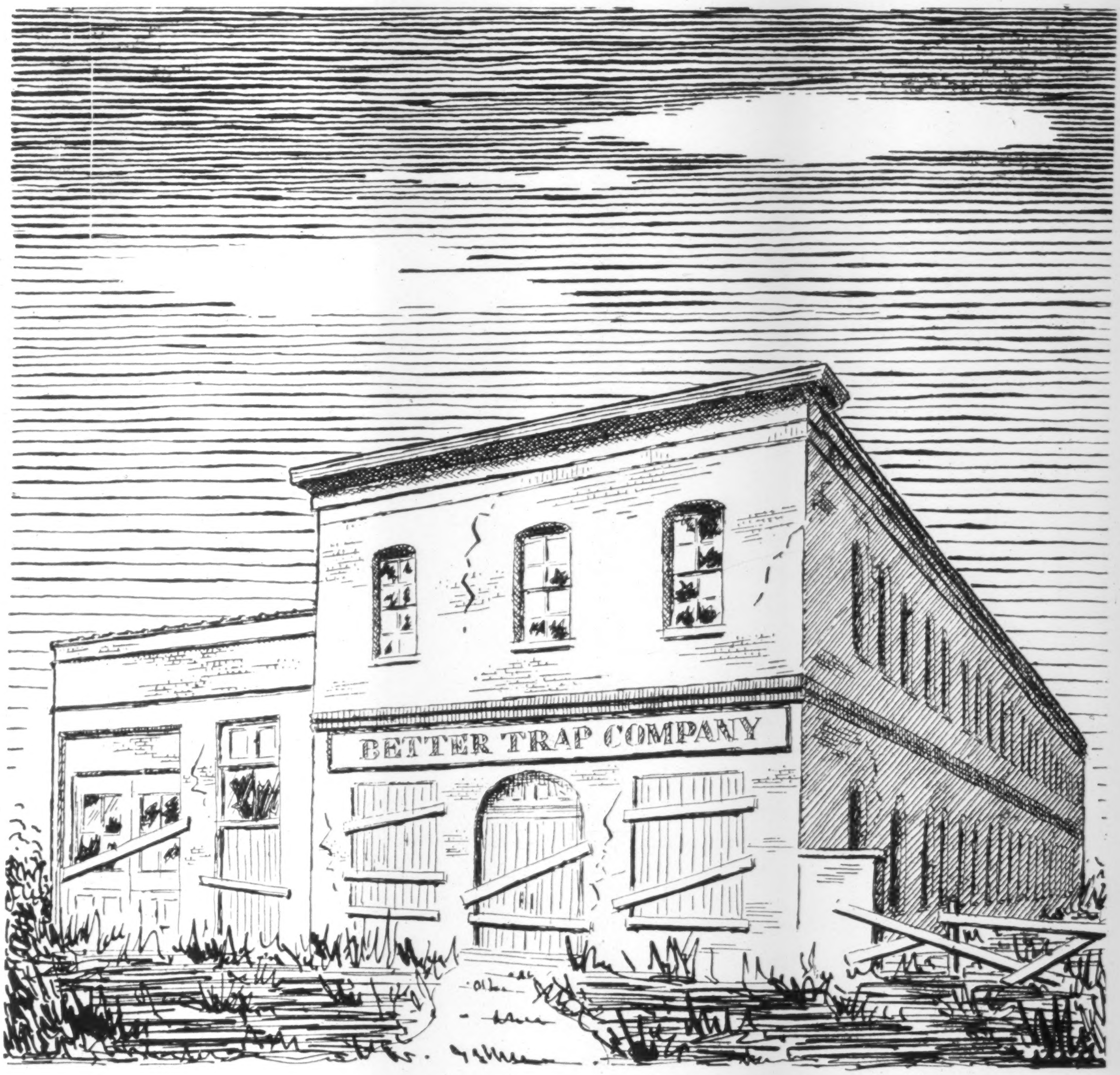
▶ *CONOFLOW CORP.*—L. F. Barnett, sales engineer for Lewis M. Crowe Co., Conoflow's sales agency for Georgia, eastern Tennessee.

▶ *OLIN MATHIESON CHEMICAL CORP.*—New regional sales managers for Ramset Fastening System are: Dale Champlin, Eastern Seaboard; R. W. Mullis, South; K. E. Van Scoy, Middle West; Samuel Winters, Far West.

▶ *JOSEPH T. RYERSON & SON, INC.*—Scott Vrooman, sales manager, Detroit; Bruce D. Clausonthue, sales manager, Chicago, replacing Mr. Vrooman.

▶ *COLEMAN CO., INC.*—Miami Valley Distributing Co., distributor for eight counties in western Ohio, four in eastern Indiana.

▶ *EMERSON RADIO & PHONOGRAPH CORP.*—Neuhauser & Wrobel Sales Agency, distributor for window and through-the-wall air conditioners in Kansas City, Wichita, Marinette, Milwaukee, Chicago, St. Louis, Louisville, Terre Haute, Indianapolis, Ft. Wayne, South Bend, Cincinnati, Toledo and Grand Rapids territories for Emerson-Quiet Kool Corp., subsidiary of Emerson Radio & Phonograph.



MOUSETRAP, STEAM TRAP, SEWER TRAP

. . . it makes no difference

. . . the world *won't* beat a path to the door of the man who builds a better one *and then doesn't advertise it* so that people will know about his product, know where it can be bought and how much it costs.

Advertising benefits the buyer, too. It tells you the product story, makes it easy for you to buy. **Even more important to you, advertising leads** to mass production and volume sales . . . which means lower costs and lower prices.

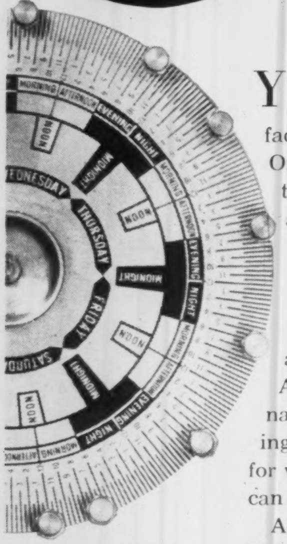
Yes, "Advertising Benefits You" . . . 'specially business-paper advertising.

YES ADVERTISING BENEFITS YOU!

All set to save on fuel bills

any day, any night, all week!

PARAGON
700 SERIES
7-DAY CALENDAR DIAL
TIME SWITCH



Turns heating equipment off when not needed

YOU can't beat the 700 series for promoting customer satisfaction through lower fuel bills! Once installed, it automatically turns heating systems ON as needed — turns them OFF during non-working-hours.

An entire week's program can be set in advance. ON-OFF can be programmed to any irregular daily schedule. Any day or days can be eliminated entirely. Monday morning ON can be earlier than usual for week-end pick up. Operations can be as close as 3 hours.

Air conditioning, ventilating, lighting, flushing, pumping and other operations can also be controlled on a weekly schedule with this 7-day time switch.

Dial is graduated into hours and half-hours. Fourteen dial trippers supplied. Available in 24, 120 and 240 volts; 25, 50 and 60 cycles. Lists as low as $29.50. Order from your jobber.

Write for information on the Paragon 2900 series to solve your off-schedule heating problems.

TODAY — Write for "Time is Money" — new Paragon handbook for you and your crews. Twenty pages of money-making ideas and handy application chart. Address Dept. 1811

PARAGON ELECTRIC COMPANY

TWO RIVERS, WISCONSIN

WHO'S WHAT

Continued

▶ *FASCO INDUSTRIES, INC.*—Jae and Meyer, Inc., representative for seven eastern states.

▶ *TYPHOON AIR CONDITIONING CO., DIV. OF HUPP CORP.*—Acar Supply Co. and United Supply & Distributor Co., wholesale distributors for Philadelphia and Baltimore areas, respectively.

▶ *COLEMAN CO., INC.*—Charles E. Yeoman, manager of new sales branch at Peoria, Ill.; Lawrence T. Ash, southeastern regional sales manager, heating and air conditioning division, succeeding Mr. Yeoman; Bernard Daly and Gerald Clark, assigned to Peoria branch.

▶ *LARKIN COILS, INC.*—Charlie Wachholtz, representative for Texas, Oklahoma.

▶ *FOXBORO CO.*—Seven new branches were opened in eastern and southeastern cities during 1956. Personnel assigned were: J. G. Bravacos, sales engineer, Augusta, Me.; G. E. Clark, branch manager, Richmond; J. G. Dobson, branch manager, North Tonawanda, N.Y.; W. H. Rhyne, sales engineer, Chattanooga; R. F. Sutton, sales engineer, Pensacola; F. J. Stevens, Jr., sales engineer, Tampa; D. C. Rosser, sales engineer, Memphis.

▶ *CONOFLOW CORP.*—Servo Mex, S.A., exclusive sales agency in Mexico.

▶ *THOR POWER TOOL CO.*—Martin A. Bertram, manager of new Great Lakes electric tool sales zone.

▶ *BRISTOL CO.*—John E. Kearns, manager of new district sales office at San Francisco.

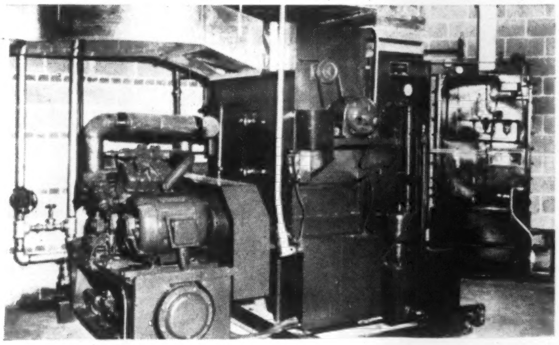
▶ *DIEHL MFG. CO.*—A. F. Haas, fan merchandising specialist in New England area.

▶ *AMANA REFRIGERATION, INC.*—Arco Distributors, Inc., distributor for 33 counties in central and northern Michigan.

▶ *A. R. WOOD MFG. CO.*—P. R. Vinet, representative assigned to newly established office at York, Pa.

▶ *ELECTROMODE DIV., COMMERCIAL CONTROLS CORP.*—Jae and Meyer, Inc., representative for northeast United States. ⧺

DRY AIR...
PRECISELY as you want it



NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

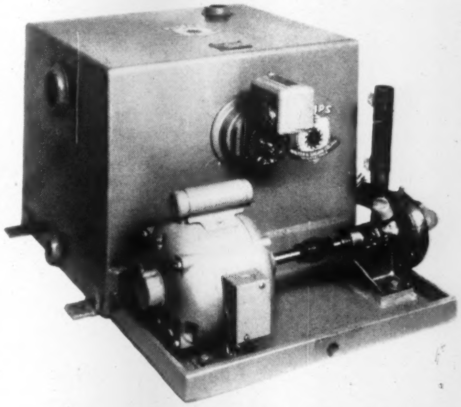
Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

Write for full information; ask for Bulletins 112 and 121. Address Dept. HP-5

NIAGARA BLOWER COMPANY
405 Lexington Ave., New York 17, N. Y.
District Engineers in Principal Cities of U.S. and Canada

GET THE EAGAN EAGLE...
The Condensate Pump with the Big Advantages



The EAGAN EAGLE does not require a pit even though return lines may be only a foot above the floor. It handles steam heating loads up to 8000 sq. ft. at 20 psi.

The low cost EAGAN EAGLE handles far more capacity than any similar pump at the same price (to 8000 sq. ft. EDR at 20 psi.) In addition this high quality, quiet operating condensate pump:

- Meets the demand for a condensate pump with a low return inlet to eliminate the need for a costly pit
- Contains an all bronze EAGAN centrifugal pump with non-clogging, open impeller, stainless steel shaft, life sealed ball bearing
- Has a *standard* 1/4 hp capacitor type motor, not a costly, special, close-coupled, hard-to-replace motor
- Has a flexible coupling and flexible connectors on both suction and discharge pipes to isolate the pump and prevent pipe cramp, misalignment, wear and noise
- Has a large capacity safety factor providing for at least 1 to 3 "on off" operation

Other models are available with capacities to 100,000 square feet at 200 psi, all with the outstanding features that make EAGAN condensate pumps so popular.

Write, wire or call us with your pumping problems and let us bid on your job.

WALTER H. EAGAN CO., INC.
Pump Specialists Since 1920
2336 Fairmount Ave., Philadelphia 30, Pa.
STevenson 7-2300

Send me information on the EAGAN pumps checked:

☐ Condensate ☐ Boiler Feed ☐ Centrifugal
☐ Turbine ☐ Fuel Oil Pump & Heater Sets

NAME ....

ADDRESS ....

CITY .... ZONE .... STATE ....

WE HEAR THAT . . .

▶ The boards of directors of *CARRIER CORP.* and *ELLIOTT CO.* have agreed upon the basis whereby Elliott will be merged into Carrier. A merger agreement will be executed in the immediate future, the companies report. When it becomes effective, Elliott will continue under its present management as a division of Carrier.

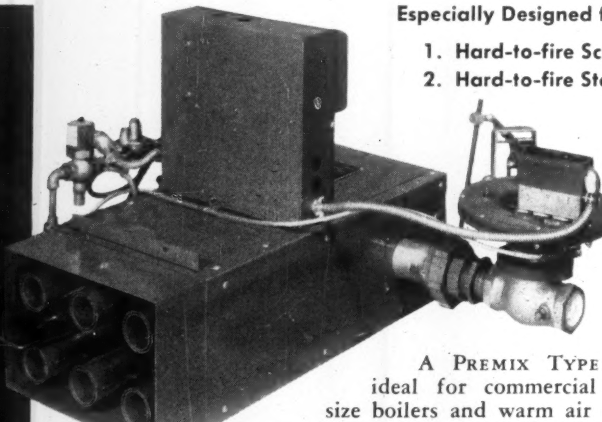
▶ *CONSOLIDATED DIESEL ELECTRIC CORP.* has reported the acquisition of the business and assets of *LIMA ELECTRIC MOTOR CO. NORMAN I. SCHAFLER*, Con Diesel president, reports that the Lima business will be operated by *LIMA ELECTRIC MOTOR CO., INC.*, a wholly-owned subsidiary. *WAYNE M. GIDEON*, a vice president of the predecessor firm, has been appointed executive vice president and general manager of the Con Diesel subsidiary.

▶ A two-classroom school building has been opened in Des Moines, Ia., "dedicated to the research of better classroom climate." Built by *LENNOX INDUSTRIES, INC.* and equipped with the company's new "Comfort Curtain" heating and ventilating system, the "Living Laboratory" will house classes from the Altoona, Ia., consolidated school district. The classes will give the engineers an opportunity to conduct clinical research, since the school has been built adjacent to the manufacturer's Des Moines plant.

▶ *DUNHAM-BUSH, INC.* has acquired the assets of *BRUNNER MFG. CO.* Stockholders of both companies endorsed by a wide margin the action previously taken by the boards of directors of Dunham-Bush and Brunner in accepting a purchase agreement. Brunner Mfg. Co., at Utica, N.Y. will be operated as the *BRUNNER DIV. OF DUNHAM-BUSH, INC.* and the Brunner Co., at Gainesville, Ga., will be a wholly-owned subsidiary of Dunham-Bush.

▶ A new and more accurately descriptive name — "Freon" Products Div. — is now being used to identify *E. I. du PONT de NEMOURS & CO.'s* organic chemicals department concerned with manufacture and sale of fluorinated hydrocarbon refrigerants. The change drops the designation of "Kinetic" Chemicals Div., under which the "Freon" compounds have been made and sold since 1950.

▶ *ROCKWELL MFG. CO.* has acquired the assets of *REPUBLIC FLOW METERS CO.* Present management of Republic will remain unchanged, with *JAMES D. CUNNINGHAM*, founder of the company, continu-



Especially Engineered to Permit . . .

HIGH FIRING RATES at HIGH EFFICIENCY

MULTURI (MULTIPLE VENTURI) BURNERS

- Formed steel mixers, finished for corrosion resistance, offer minimum resistance to mixture flow, result in uniform high capacity.
- High temperature resisting stainless steel flame retainers insure flame stability over a wide capacity range.
- Mixer design produces a hot clear flame, results in high combustion efficiency with minimum excess air.

Especially Designed for . . .

1. Hard-to-fire Scotch Marine Boilers
2. Hard-to-fire Steel Fire Box Boilers

Multuri Burners available in standard units, 4 to 54 mixers. Capacities 700,000 to 10,800,000 BTU/hr. Higher capacities can be furnished.

A Premix Type Gas Burner, ideal for commercial and industrial size boilers and warm air furnaces. Gives maximum performance from hard-to-fire Scotch Marine and steel fire box boilers. Controlled flame characteristics make the burner a natural for units with extensive refractory surface. Suitable for any gas at 4" gas pressure or more. Permits high firing rates at high efficiency. Simple to install, adjust, and operate. Completely Factory Wired and Assembled — Ready for Immediate Installation !

Write for detailed information—or for a questionaire listing all the data necessary for correct specifications and efficient installation.

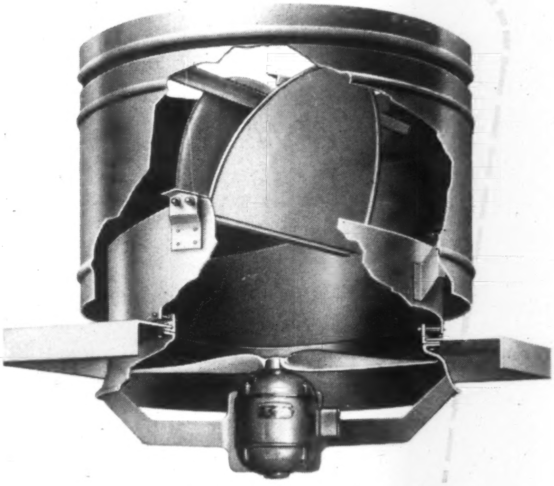
GORDON BYDAND
GAS HEATING EQUIPMENT

ROBERTS-GORDON
DEPT. HPAC BUFFALO 6, N. Y.

FURNACES • COOLING UNITS • BOILERS • UNIT HEATERS • GAS BURNERS

SKY-BLAST®

moves more air at less cost



...powerful roof ventilator with NEW Smoke-Trip® Damper Opener

Because Propellair Sky Blast roof ventilators do not need the usual restricting weather cover which deflects and reduces air movement, they move more air at less cost. Fumes and heat are thrown high into the air, can't re-enter windows or turn downward to create roof maintenance problems. Their efficiency is not effected by wind velocity or direction. Weatherproof dampers open automatically when fan is started. Hot-dip galvanized after fabrication, Propellair Sky Blast ventilators are ruggedly built to give years of maintenance-free service. Available in sizes from 16" to 60" for 2820 to 78,800 CFM—PFMA Certified Ratings.

If desired, exclusive new Smoke-Trip heat-actuated venting device which automatically opens dampers in case of fire to exhaust smoke and fumes is available.

WRITE FOR BULLETIN NO. 680-HP

R&M **PROPELLAIR®**

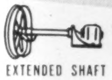
DIV. OF ROBBINS AND MYERS, INC.
SPRINGFIELD, OHIO

Certified Ratings PFMA

MAN COOLER

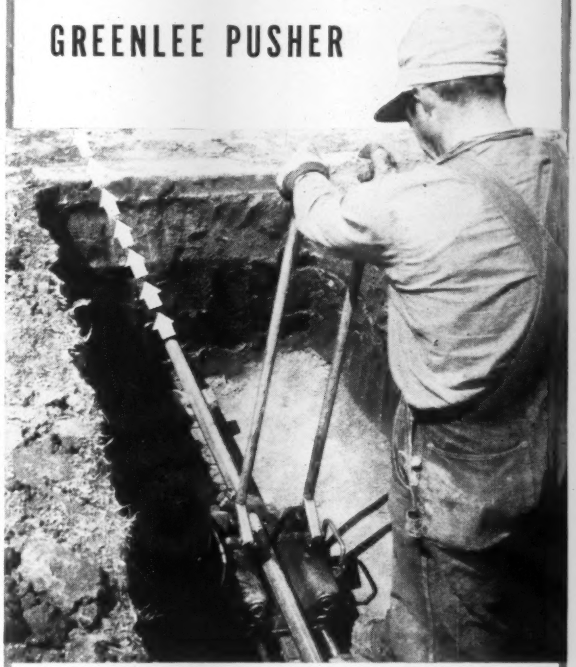
VANEAXIAL

TUBEAXIAL


EXTENDED SHAFT

MOVING AIR IS OUR BUSINESS

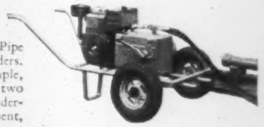
CUT COSTS ON UNDERGROUND PIPING INSTALLATIONS WITH GREENLEE PUSHER



Save hours of time, cut job costs with this quick, easy way of installing underground pipe. With a Greenlee Hydraulic Pipe Pusher, *one man* pushes pipe *under* streets, walks, tracks, lawns, floors, and other obstacles. No costly tearing up of paving . . . eliminates extensive ditching, as just a short trench accommodates the Pusher. No tedious tunneling, backfilling, tamping, repaving. Compact, portable, powerful. Often pays for itself on first few jobs. Thousands in use for big savings of time and labor. Two models: one for ¾ to 4" pipe, one for larger pipe, concrete sewer pipe, drainage ducts. Write for facts today.

POWER PUMP

For all models of GREENLEE Pipe Pushers and Hydraulic Pipe Benders. Makes the toughest pushing jobs simple, fast. Average pushing performance: two feet per minute. Rubber-wheeled undercarriage, available as extra equipment, provides convenient, easy way to transport and move about on job location.



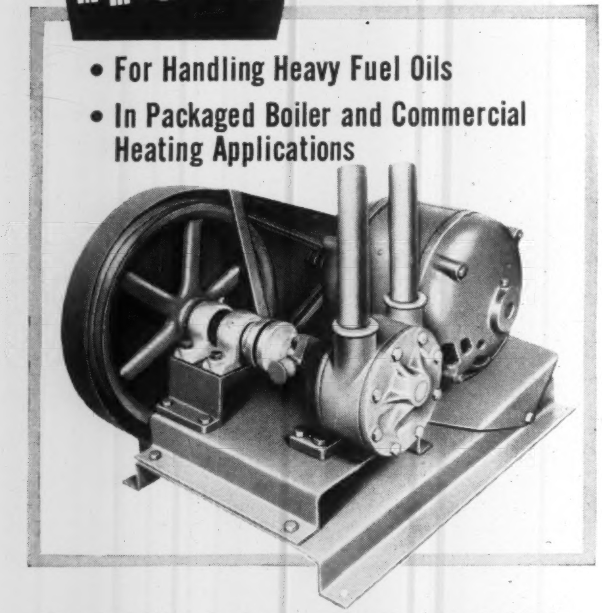
TOOLS FOR CRAFTSMEN
GREENLEE

Greenlee timesaving tools for plumbing and heating work: Hydraulic Pipe Pushers • Hydraulic Pipe Benders • Tubing Benders • Pipe Bits Auger Bits • Spiral Screw Drivers • Chisels • And many more
Greenlee Tool Co., 2345 Twelfth Street, Rockford, Illinois

new

TUTHILL
SU
PUMP UNIT

- For Handling Heavy Fuel Oils
- In Packaged Boiler and Commercial Heating Applications

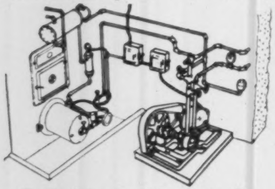


Economically priced, TUTHILL'S SU PUMP UNIT has been specifically developed for handling heavy fuel oils in commercial heating applications and with packaged boilers.

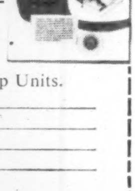
This "v" Belt Driven Unit is compact—complete units measure only 24¼" x 14⅝". Quiet operation is insured by the 2 or 4 "v" Belt Drive and the integral gear positive displacement pump design.

Construction features which provide dependable trouble-free operation, lower maintenance costs, include two ball bearing pillow blocks, one point take-up for simple adjustment of belt tension, removable belt guard and new fabricated steel base with versatile motor mounting.

SU PUMP UNITS can be furnished with a wide variety of pumps and motors for pressures up to 300 psi, capacities to 2030 gallons per hour. Sub-assemblies of pump, stub shaft, pillow block and sub-base are also furnished separately as a unit for incorporation into systems by boiler and furnace manufacturers. Write today for complete information.



Typical Application of SU Unit



TUTHILL PUMP COMPANY
947 East 95th Street, Chicago 19, Illinois
Gentlemen:
Please forward Catalog describing Tuthill SU Pump Units.
NAME__________ COMPANY__________
TITLE__________
STREET__________
CITY__________ STATE__________

TUTHILL PUMP COMPANY
947 East 95th Street, Chicago 19, Ill.
Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

PUMPS FOR YOUR PURPOSE

WE HEAR THAT

Continued

ing as president. *W. F. CRAWFORD*, president of *EDWARD VALVES, INC.*, a Rockwell subsidiary, will be associated with the Republic management in Chicago.

▶ Groundbreaking ceremonies were held recently for the million dollar research park engineering center to be built in suburban Johnstown, Pa., by *NATIONAL-U.S. RADIATOR CORP.* The first spadeful of earth was turned with a silvered shovel by *L. N. HUNTER*, senior vice president, who will be director of the center.

▶ *JOY MFG. CO., AMMERMAN CO., INC.*, and *MARLO COIL CO.* have been elected to membership in the Air Moving and Conditioning Association.

▶ *WORTHINGTON CORP.*'s air conditioning and refrigeration division has established a new internal sales organization to handle the division's business through franchised outlets. Seven district offices headquartered in Cleveland, New York, Philadelphia, Los Angeles, Atlanta, Chicago and Houston will handle franchised outlet business exclusively and will operate separately from the present Worthington district sales office network.

▶ After 92 years of doing business in the building at 156 N. Jefferson St., Chicago, *CRANE CO.* is packing up its valves and fittings and is moving its sales branch to the suburbs. It is opening a new Chicago area branch at 9231 W. Belmont, Franklin Park, Ill.

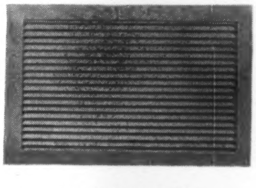
▶ A special train, "The B & G Line," transported over 150 heating and air conditioning contractors, engineers and wholesalers attending the 13th International Heating and Air-Conditioning Exposition from downtown Chicago to *BELL & GOSSETT CO.*'s plant in Morton Grove, Ill. The occasion was a train ride and plant tour operated by Bell & Gossett.

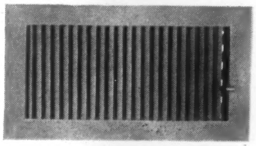
▶ *RESEARCH-COTTRELL, INC.* has announced the addition of the "Aerodyne" dust collector to its line. The product was formerly manufactured by *AERODYNE DEVELOPMENT CO.*

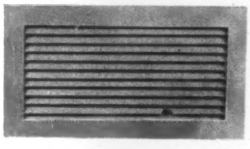
▶ An expanded program of valve research and development has been announced by *L. A. DIXON, JR.*, vice president of *ROCKWELL MFG. CO.*'s meter and valve division. The program, under *RUSSELL L. SYLVESTER*, chief engineer for valve products, will be augmented by a new valve laboratory and machine shop at Pittsburgh, the company reports.

Problem: Return Air Application
Solution: A-J No. 42 SERIES
GRILLES and REGISTERS

MAXIMUM
PERFORMANCE
WITH
MINIMUM
SEE-THROUGH


No. 42-H Grille


No. 432-V Register


No. 442-H Volume Control Register

Now — you can get masterfully engineered return air control and effective dust concealment. This marvelous combination is made possible by the new A-J No. 42 Series Grilles and Registers!

Here's the secret: A-J has placed the face bars on ½" centers with a 45° deflection. This provides unhampered air flow and at the same time minimizes see-through. The face bars (20 gauge cold-rolled steel) are available in both horizontal and vertical styles, depending on individual use and preference.

The No. 42 grille is available with a multiple valve register body (No. 432-V or H). An added advantage is a control handle which can be either removed after the system is in balance to discourage tampering with the valve setting, or left in place to adjust when required.

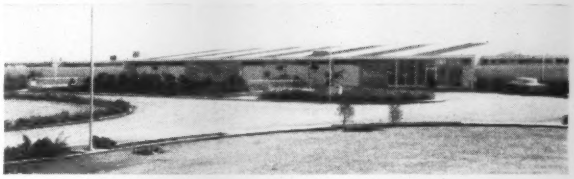
If you like, you can also get the No. 42 grille with a vertical opposed blade damper (No. 442-V or H). The damper is the A-J No. 44 damper, and is adjustable through the face of the grille with a No. 2 or 3 Phillips Screw Driver.

The frame enclosing the grille core is the proven wrap-around frame as furnished in other A-J air conditioning registers and grilles as well as in the no-vision series. The rims are ⅞" beyond duct size on all sides. Rims have counter-sunk screw holes and No. 8 sheet metal screws, plated, are furnished. Gasket is furnished on No. 432 and No. 442 styles. Standard finish is gray prime. It is also possible to order all-aluminum models.

For complete information on the No. 42 Series, as well as on other famous A-J products, write now for your copy of the A-J catalog. It contains over 1,000 types and sizes of A-J grilles, registers, etc.

A-J Manufacturing Co.

3601 East 18th St.   Dept. H-5   Kansas City, Mo.

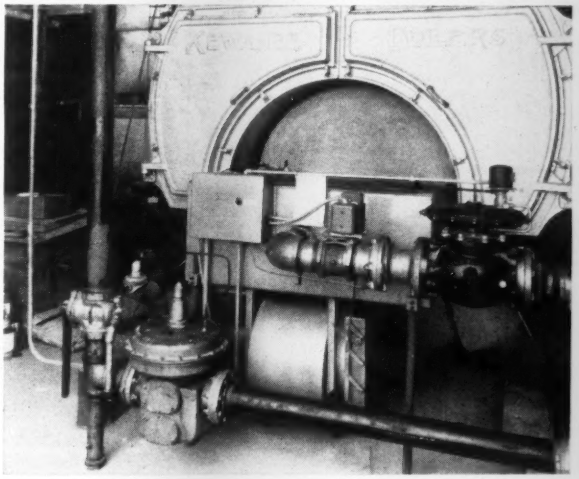


Hot water for 1,000 cabanas

heated at less-than-expected cost by

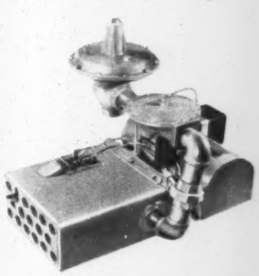
LO-BLAST

POWER GAS BURNER



At beautiful Malibu Beach Club, Lido Beach, Long Island, N. Y., the hot water demand of these cabanas creates an exceptionally heavy load. 1000 showers and the kitchen facilities of two restaurants are amply and economically supplied by a 450 horsepower Scotch Marine boiler, automatically gas-fired by a 20,000,000 BTU-Lo-BLAST Burner. Manufactured gas is furnished by the Long Island Lighting Company, which reports that *operating cost is less than estimated at the time of installation!*

Lo-BLAST Power Burners use an extremely quiet, low-speed blower to provide perfectly controlled primary and secondary air...operation is always independent of natural draft. These burners eliminate the need for high chimneys—inshot design reduces maintenance cost. All units are completely assembled and tested on gas before shipment.


Capacities 75,000 — 20,000,000 BTU/hr. input.

Lo-BLAST Burners average 10% less in operating cost!

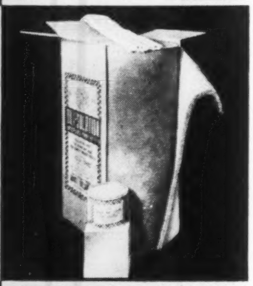
MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

THESE
Grant Wilson
PRODUCTS

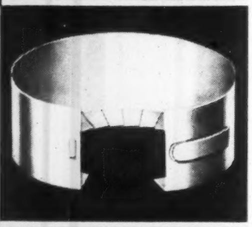
Complete the job...give it that "custom" look...that extra measure of efficiency!

FLEXI-DUCT...
The original flexible asbestos duct connector that stops *more* noise, costs little, installs easily. Meets National Board of Fire Underwriters' requirements.

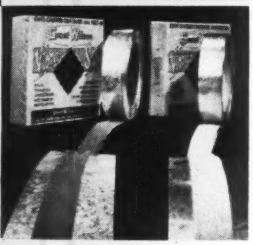
DUX-SULATION...
The duct insulation specified when nothing but the best procurable is desired—costs more and worth it. A complete package—maximum efficiency, lifetime service.



PIPE COVERING PROTECTOR CUPS...
The all-aluminum adjustable cup that protects exposed ends of pipe covering—the finishing touch on all pipe insulating jobs.



VIBRA-STOP..
Type A (asbestos) and Type C (canvas)—both punch-lock sealed to No 1 prime galvanized metal. Underwriters' grade asbestos and canvas meets Fed. Specs. MIL-C-4177 and MIL-D-10860. Both 24 and 26 gauge metal. 25, 50 and 100 foot rolls.



Grant Wilson inc.
ASBESTOS and INSULATING MATERIALS
141 W. JACKSON BLVD., CHICAGO 4, ILLINOIS

▶ Three regional trade associations have been formed by members of the National Industrial Service Association, Inc. Electric motor, generator and transformer service and sales firms have joined to form the Rocky Mountain, Heart of America, and Connecticut chapters of NISA.

▶ *WALTER F. ROGERS*, chief chemist, Houston production division chemical laboratory, *GULF OIL CORP.*, and *CARL WAGNER*, professor of metallurgy at Massachusetts Institute of Technology, have been selected to receive the 1957 awards of National Association of Corrosion Engineers. Mr. Rogers will receive the Frank Newman Speller Award for achievements in corrosion engineering and Dr. Wagner will receive the Willis Rodney Whitney Award for achievements in corrosion science.

▶ *ARMCO STEEL CORP.* plans to spend $50 million to expand its Ashland, Ky., and Houston, Tex., plants, the company reports. The expansion will increase the company's capacity by 750,000 tons of ingots per year and bring Armco's total ingot capacity to nearly 7 million tons by mid-1959, according to *R. L. GRAY*, Armco president.

▶ *READING TUBE CORP.* has completed arrangements to acquire *MACKENZIE WALTON CO.*, Pawtucket, R.I. Mackenzie Walton manufactures nonferrous seamless tubing for instruments, gages, pressure controls and recording equipment as well as for other applications.

▶ *BORG-WARNER CORP.* plans to invest approximately $26 million in new plants and modern equipment this year, according to *ROY C. INGERSOLL*, chairman of the board.

▶ *LINDE AIR PRODUCTS CO.* has produced a new 20 min sound and color film, "Modern Methods for Joining Metals," which shows a variety of welding processes and applications. Arrangements to see the picture can be made by contacting Linde.

▶ *TRANE CO.* has established regional warehouse distributing centers in New York, Chattanooga, Kansas City, Dallas and Cleveland, the company announces. The supply depots are designed to serve as centers for distribution of the company's package air conditioners.

▶ Plans to expand *BABCOCK & WILCOX CO.*'s research center at Alliance, O., have been announced. A building will be erected at the center to keep pace with

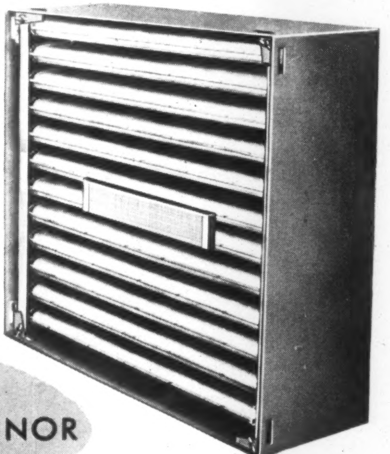
FOUL AIR FOULING YOUR OPERATION?

It was at Metalphoto Corporation, Cleveland, Ohio. The company makes photosensitive aluminum plates for direct printing of name plates, dials, scales and similar products. From time to time, batches of these plates became chemically fogged, primarily by sulfide gases from nearby industrial plants.

Metalphoto searched for a remedy—and found it in Dorex Air Recovery. In the area where the plates are light sensitized, Dorex activated carbon filters were installed. Ventilating air was admitted only through them. The results? Here's the report from Metalphoto's Vice President R. A. Kempe:

"It's been almost a year since Dorex went in, and not a single plate has been spoiled due to gaseous impurities. We estimate the cost of the complete Dorex installation to be less than one half our loss from just one batch of damaged plates."

If air pollution is your problem, count on Dorex to solve it. Why not get the full details on Dorex Air Recovery now? Write to the Connor Engineering Corporation, Dept. A-57, Danbury, Connecticut.



CONNOR
ENGINEERING CORPORATION
dorex®
air recovery

COMBUSTION EQUIPMENT
ENGINEERED By..... THE
WEBSTER
ENGINEERING COMPANY

Another first
by
WEBSTER

Flame Retention RING GAS BURNER

Through a *new* application of an old basic principle WEBSTER now offers unequalled stability in an non-premixing ring gas burner.

Presently packaged as Series H, Forced Draft for Gas, Rotary Oil or Combination this revolutionary development will soon be available in other variations.

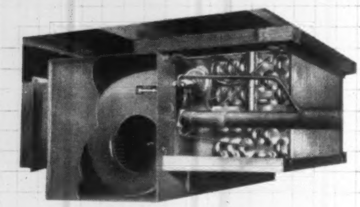
Write for Series B13 literature.

Some Territories Open

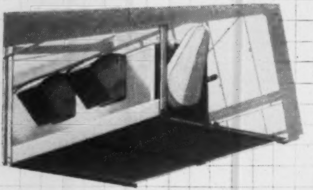
The
WEBSTER ENGINEERING
Company
TULSA 16, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

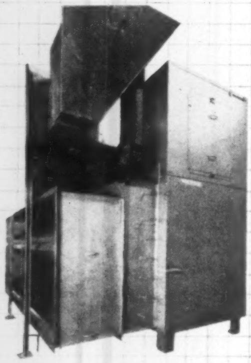
ONE-SOURCE
dependability!



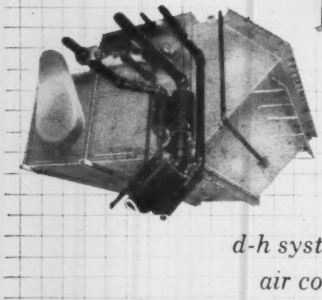
A TRACT HOME
d-h SPOTAIRE HRC
air conditioning from Crawl Space



A NEW DEFENSE PLANT
d-h AM *heating and ventilating equipment*



A 100-YEAR OLD CHURCH
d-h HHV-*Series air handling units*



A 450-ROOM HOTEL
d-h FZ *multizone air conditioners*

d-h system-type air conditioning
. . . 4 out of 7 complete lines in action—for any job.

Want the Full Story?

d-h SINCE 1910

drayer-hanson

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DIVISION OF NATIONAL-U.S. RADIATOR CORP.

WE HEAR THAT

Continued

the nuclear engineering research activities being carried on by the company. Also, a two-bay addition will be made to the mezzanine of an existing structure.

▶ For the second year in succession *DAY & NIGHT MFG. CO.* has opened the year with a series of advanced air conditioning engineering schools to be held throughout the U.S. for interested dealer personnel. Present reservations call for the company's team of sales engineers to hold schools in more than 25 cities.

▶ In conjunction with the celebration of its silver anniversary year, *RECOLD CORP.* has construction underway to expand its office facilities. The addition of 2000 sq ft will be used for clerical office space.

▶ *JOHN WOOD CO.* has purchased a 16 acre tract of land in Florham Park, N.J. for future expansion of its engineering and research division.

▶ *FRED S. DUBIN ASSOCIATES,* consulting engineers, has relocated its offices from 262 Fifth Ave. to 312 Seventh Ave., New York 1.

▶ *JOSEPH T. RYERSON & SON, INC.* has leased property in St. Louis which will be used to expand the company's operations in that city. The property has a total area of 67,200 sq ft, of which 31,200 sq ft is improved with a one-story building. A two-span warehouse will be erected on the vacant portion, adding 36,000 sq ft more under roof.

▶ *POWERS REGULATOR CO.* has moved its Dallas district operations into a new 3500 sq ft office and warehouse building in the Brook Hollow industrial district.

▶ An open house officially opened the enlarged, modern quarters of A. A. Duckett, Inc., a *CARRIER CORP.* distributor serving south New Jersey since 1919.

▶ *PHILIP CAREY MFG. CO.* has been cited for its "excellent management" in 1956 by American Institute of Management. It is the fifth consecutive year that the company has been cited by the institute.

▶ A new mill depot has been opened in Boston by *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.* The structure will stock copper water tube, refrigeration tube and automotive tube.

put
Extra-Profits
in your
pocket
with

"engineer-
approved"

ELGEN *All-Tite* VANE RUNNERS
NOW IN COILS!

OPEN THIS END
PULL HERE THIS END UP USE NO HOOKS
Save Time and Money... with ELGEN 'All-Tite' VANE RUNNERS

THE EASIEST AND QUICKEST WAY EVER DEVISED

for installing single or double blade turning vanes in square elbows. No special tools required.

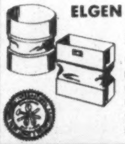
New production machinery of our own exclusive design, now enables us to produce button type Elgen All-Tite vane runners in continuous coils, effecting a savings in *your cost per job.*

COILED ELGEN ALL-TITE VANE RUNNERS MEANS . . .

- *Less Waste!* Waste pieces due to short ends are a thing of the past. Vane runner metal is coiled in 100 foot lengths, you just pull out the exact footage needed.
- *Easier Storage!* Each coil weighs approximately 50 lbs. and is packed in a box 28" x 28" x 5". Box fits easily under bench or against wall.
- *Easier Handling!* No loose pieces lying around to get in the way or collect dirt.
- *Unrolls absolutely flat!* Vane runner metal emerges from the box at bench height . . . absolutely flat . . . ready for use.

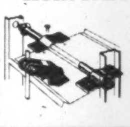
TWO MORE ENGINEER-APPROVED ELGEN PRODUCTS THAT SAVE YOU TIME AND MONEY

ELGEN SILENT DUCT



. . . for forming "flexible" duct connectors. A one piece metal to material unit, packed in coils, unrolls absolutely flat. Makes on the spot work a cinch.

ELGEN DAMPERSET



. . . for multi-blade dampers, parallel or opposed. Most perfect damper hardware developed.

ELGEN PRODUCTS ARE SOLD THROUGH LEADING JOBBERS EVERYWHERE.

Write today for free catalog and "spec" sheet!

ELGEN MANUFACTURING CORP.
41-34 39th Street, Long Island City 4, N. Y.

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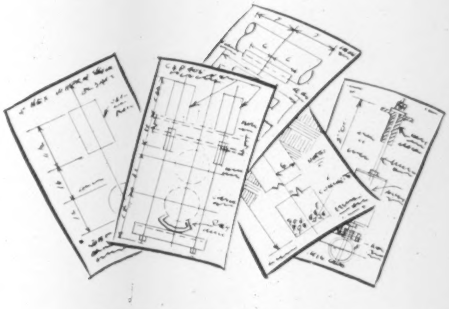
PIPE HANGERS
FOR
HEATING – PLUMBING POWER & PROCESS

GOT A TOUGH PIPE HANGING PROBLEM?

FORGET IT!!!

YOUR TOUGH PROBLEMS HAVE BEEN OUR BUSINESS FOR 42 YEARS



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Company..

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City............................Zone......State....................

WE HEAR THAT

Continued

▶ *GENERAL FITTINGS CO.* has purchased *HAYDEN HEATER CO.* Hayden's manufacturing facilities have been moved to East Greenwich, R.I., where they will continue as the Hayden Heater Div. of General Fittings Co. *SYDNEY J. HAYDEN*, former president, continues as general manager of the division.

▶ *CONTROLS CO. OF AMERICA* has announced an expansion program to increase assembly and fabrication operations at the Nijmegen, Holland, plant of its subsidiary, Controls Maatschappij Europa N.V. The company is building a 7000 sq ft addition to the present plant and has acquired more than 55,000 sq ft of adjacent land for future expansion.

▶ *HAJOCA CORP.*, wholesale distributor of heating, air conditioning, industrial and refrigeration supplies, has purchased *FRANK HOCKETT SUPPLY CO., INC.*, Greensboro, N.C. Hajoca began operation of the Hockett company as a branch in February.

▶ Having outgrown its present facilities in Philadelphia, *AUTOMATIC TEMPERATURE CONTROL CO.* is planning to move to a new plant at King of Prussia, Pa. The move to the new 74,000 sq ft structure is scheduled for July or August. The building will provide ATC with facilities for manufacturing, engineering and research, plus general and administrative offices.

▶ *EUTECTIC WELDING ALLOYS CORP.* recently opened a new warehouse-service center at Huron, S.D. The facility is located at 358 Wisconsin Ave., S.W.

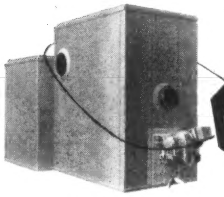
▶ A new warehouse, designed to better serve customers in parts of Indiana, Kentucky and Ohio, has been opened by *WHEELING CORRUGATING CO.* The facility, at 1785 Kenny Rd., Columbus, Ohio, covers approximately 10,000 sq ft of floor space.

▶ *JOHNSON SERVICE CO.* has reported changes of address for its branch offices at Albany, N.Y., and Nashville, Tenn. Albany operations have been moved to 13 Warehouse Row, while the Nashville branch has relocated to 105 16th Ave., S.

▶ A special award in observance of its 20th anniversary as a *CARRIER CORP.* distributor has been made to *UNITED CLAY PRODUCTS CO.*, Washington, D.C. +

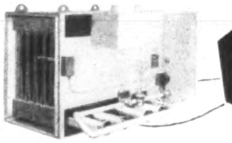
JACKSON & CHURCH FURNACES

HANDLE DIFFICULT HEATING JOBS



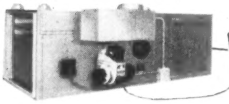
J·C POWERATED SERIES

Jackson & Church engineering has produced a new Powerated furnace line which matches today's heaviest duty requirements. These new furnaces develop static pressures up to 1½" W. C. with lock-seam, leakproof casings designed to carry the heaviest air load over the unit for air conditioning. Oil, gas or dual-fuel firing with outputs from 152,000 to 3,800,000 Btu The J-C Powerated Series incorporates the latest advances in modern industrial and commercial heating.



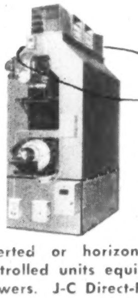
J·C GAS·FIRED SUSPENDED SERIES

Available for heating plants, stores, churches, schools and other large structures, these new gas-fired models have inputs of 200,000 to 400,000 Btu, with some units approved either as horizontal furnaces or as blower type heaters. These J-C units provide the convenience of gas firing plus all the advantages of suspended type heating such as savings in floor space and almost limitless zone heating possibilities. Drawer type burners for easy accessability, easy installation. J-C gas-fired suspended furnaces are built for minimum maintenance.



J·C OIL·FIRED SUSPENDED SERIES

Space-saving oil-fired suspended models, available in a wide range of sizes with outputs of 89,000 up to 1,000,000 Btu, these easily installed units are most versatile in application. They can be installed singly or in batteries, and can supplement other heating for plant expansion and they are readily adapted to year round air conditioning. These dependable units solve many commercial and industrial heating problems.



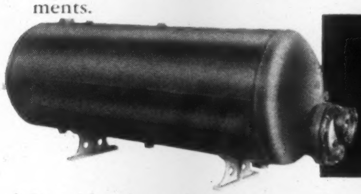
J·C DIRECT·FIRED SERIES

With outputs from 400,000 to 2,000,000 Btc, and available for oil, gas or dual-firing, J-C Direct-Fired units are ideally adapted for large commercial or industrial heating jobs. They may be installed on the floor, or suspended either inverted or horizontally. They are self contained, automatically controlled units equipped with induced draft fan and air circulating blowers. J-C Direct-Fired Unit design makes savings possible in both installation and maintenance costs.

J-C JACKSON & CHURCH — FURNACE DIVISION
Saginaw, Michigan

NO WAITING FOR THESE HEATERS

Ready for immediate shipment to serve your water heating needs, Whitlock Heaters save you time. And they save you money, too, because these design-proven heaters are quantity-produced in several standard sizes. Select the size to suit your requirements.



TYPE K STORAGE HEATERS

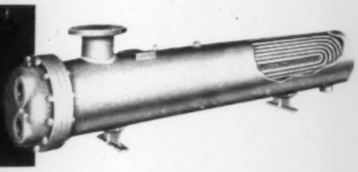
Provide clean, hot water at lowest possible cost. Available in various capacities and constructions, — with standard steel shell, copper-lined steel shell, Konkrete-lined shell, or silicon bronze shell, and in Horizontal or Vertical models.

Shell Size	Shell and Head Thicknesses	Storage Capacity	*Heating Capacity
30" x 96"	¼" x ⅜"	280 Gal.	500 GPH
36" x 120"	¼" x ⅜"	500 Gal.	800 GPH
42" x 120"	⅜" x ½"	680 Gal.	1250 GPH
48" x 120"	⅜" x ½"	870 Gal.	1500 GPH

*40° to 180° F with steam at atmospheric pressure. Construction and stamping in accordance with ASME Code.

Ask for Bulletins 40B and 46.

TYPE R INSTANTANEOUS HEATERS



Assembled with removable copper U-tube heating section bolted into steel shell. Design permits each tube to thermally expand independent of shell, without placing stress on either part. Four popular sizes are regularly in stock for prompt shipment.

Ratings — Gallons per Hour — Steam at 0 PSIG
Temperature Range — °F.

Heater Size	40° — 160°	40° — 180°	50° — 160°	50° — 180°	60° — 160°	60° — 180°	80° — 180°
6-B-60	630	260	685	290	785	325	410
6-B-84	1330	625	1375	670	1575	715	930
8-B-72	1920	840	2000	940	2100	980	1280
8-B-96		1670		1800		1940	2370

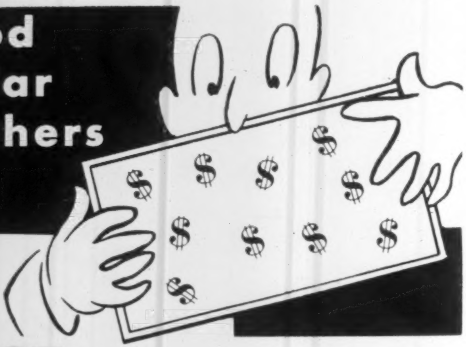
Stamped in accordance with Par. U-69, A.S.M.E. Code, for 100 psig working pressure.

Ask for Bulletins 23A and 61.

THE WHITLOCK MANUFACTURING CO.
44 South St., West Hartford 10, Conn.
New York • Boston • Chicago • Philadelphia • Detroit • Richmond
Authorized Representatives in Other Principal Cities
In Canada: Darling Brothers, Ltd., Montreal

Whitlock HEATERS

Good dollar catchers too



DUST-magnet® lifetime electrostatic air filter

Here's a profit item that's loaded with selling punch. Everybody wants the convenience and economy of this air filter that catches more dirt, dust and pollen . . . quickly rinses clean. No sticky coating. Exclusive plastic fabric grabs dust, dirt and pollen by electrostatic action. Dust-magnet is UL-approved, standard on many leading brands of air conditioning, warm air heating and commercial refrigeration equipment. Ask your jobber or write for details.

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AIR CONDITIONING is our SPECIALTY

Refrigeration and Electric Motors, Too!

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OVER 10,000 ITEMS... the world's most comprehensive listing of parts and supplies ... appear in the Harry Alter DEPENDA-BOOK No. 166 Summer, 1957 complete with illustrations, descriptions, prices and other useful information.

SAVE MONEY, time and effort by ordering the parts you need from this compact, easy-to-read, up-to-date catalog.

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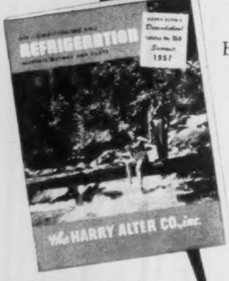


MEETINGS & CONVENTIONS

MAY 7-10—Mechanical Contractors Association of America, annual meeting. Hotel Fontainebleau, Miami Beach. The association is at 30 Rockefeller Plaza, New York 20.

MAY 8-11—Fluid Control Institute, Inc. The Greenbrier, White Sulphur Springs, W. Va. Information: Fluid Control Institute, Inc., P. O. Box 191, Decatur, Ill.

MAY 12-15—National Industrial Service Association, Inc., 24th annual convention. Hotel Statler, Buffalo. NISA headquarters: 818 Olive St., St. Louis 1.

MAY 14-16—Industrial Nuclear Technology Conference. Museum of Science and Industry, Chicago. Information: Dr. Leonard Reiffel, Armour Research Foundation, Illinois Institute of Technology, 10 W. 35th St., Chicago 16.

MAY 15-16—Water Conditioning. University of Wisconsin, Madison. Information: Paul J. Grogan, institute coordinator, University of Wisconsin, Madison.

MAY 20-22—National Association of Corrosion Engineers, northeast region corrosion control conference. Syracuse University, Syracuse, N.Y. NACE headquarters: 1061 M & M Bldg., Houston 2.

MAY 20-23—Design Engineering Show. Coliseum, New York. Management: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

MAY 20-24—National Fire Protection Association, 61st annual meeting. Hotel Statler, Los Angeles. NFPA headquarters: 60 Batterymarch St., Boston.

JUNE 2-6—Air Pollution Control Association, golden jubilee meeting. St. Louis. Information: Harry C. Ballman, executive secretary, APCA, 4400 Fifth Ave., Pittsburgh 13.

JUNE 3-5—American Society of Refrigerating Engineers, 53rd annual meeting. Hotel Fontainebleau, Miami Beach. ASRE headquarters: 234 Fifth Ave., New York.

JUNE 3-6—National District Heating Association, 44th annual meeting. The Homestead, Hot Springs.

Va. Information: John F. Collins, Jr., secretary-treasurer, NDHA, 827 N. Euclid Ave., Pittsburgh.

JUNE 3-7—*Oil-Heat Institute of America, Inc.*, 35th annual convention, Sheraton-Plaza Hotel, Boston. OHI headquarters: 500 Fifth Ave., New York 36.

JUNE 5-7—*National Warm Air Heating and Air Conditioning Association.* West Coast summer convention, Fairmont Hotel, San Francisco. NWAHACA headquarters: 640 Engineers Bldg., Cleveland 14.

JUNE 11-13—*Third Western Plant Maintenance and Engineering Show.* Civic Auditorium, San Francisco. Management: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

JUNE 16-21—*American Society for Testing Materials.* Chalfonte-Haddon Hall, Atlantic City. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 24-27—*American Society of Heating and Air-Conditioning Engineers, Inc.*, semi-annual meeting, Manoir Richelieu, Murray Bay, Quebec. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St., New York 13.

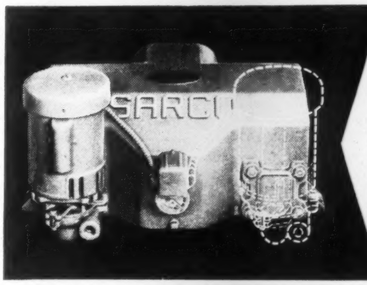
AUG. 11-15—*First National Conference on Applied Heat Transfer.* Pennsylvania State University, University Park, Pa. Sponsored by heat transfer division and central Pennsylvania section of American Society of Mechanical Engineers in cooperation with College of Engineering and Architecture of the University. ASME headquarters: 29 W. 39th St., New York 18.

SEPT. 9-13—*12th Annual Instrument Automation Conference and Exhibit.* Cleveland Auditorium, Cleveland. Sponsored by Instrument Society of America, 313 Sixth Ave., Pittsburgh 22. Exhibit information: Fred J. Tabery, 3443 S. Hill St., Los Angeles.

SEPT. 18-20—*Insulation Distributor-Contractors National Association, Inc.*, second annual convention. St. Francis Hotel, San Francisco. Information: IDCNA, 1632 K St., N.W., Washington, D.C.

OCT. 1-4—*National Association of Corrosion Engineers*, north central regional meeting, Chicago. NACE headquarters, 1061 M & M Bldg., Houston 2.

OCT. 1-4—*National Association of Corrosion Engineers*, south central regional meeting, Oklahoma City. NACE headquarters, 1061 M & M Bldg., Houston 2.



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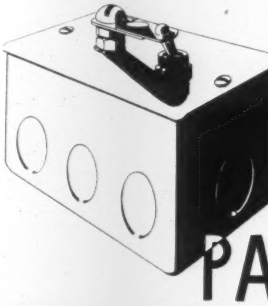

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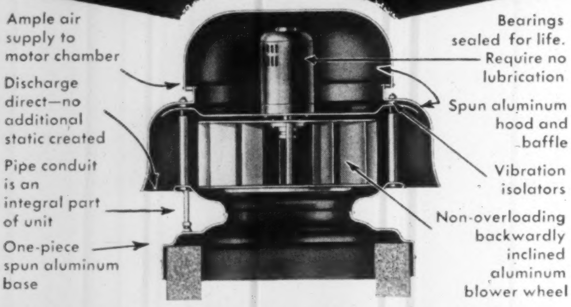
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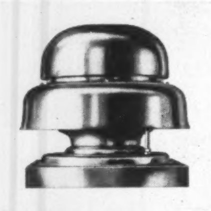

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OCT. 6-8—*Fluid Control Institute*. Westchester Country Club, Rye, N.Y. Information: Fluid Control Institute, Inc., P. O. Box 191, Decatur, Ill.

OCT. 7-9—*American Gas Association*, annual convention. Kiel Auditorium, St. Louis. AGA headquarters: 420 Lexington Ave., New York 17.

OCT. 21-25—45*th National Safety Congress & Exposition*. Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

OCT. 22-24—*National Association of Corrosion Engineers*, seventh annual western regional conference. San Diego. Information: NACE, 1061 M & M Bldg., Houston 2.

NOV. 12-14—*National Association of Corrosion Engineers*, northeast regional meeting. Pittsburgh. NACE headquarters: 1061 M & M Bldg., Houston 2.

NOV. 13-14—*Air Pollution Conference*. Chicago. Cosponsored by Armour Research Foundation and Midwestern Air Pollution Prevention Association. Information: Conference secretary, Armour Research Foundation, 10 W. 35th St., Chicago 16.

NOV. 14-16—*American Society of Refrigerating Engineers*, semi-annual meeting. Morrison Hotel, Chicago. ASRE headquarters: 234 Fifth Ave., New York.

NOV. 16-18—*Air-Conditioning and Refrigeration Wholesalers*, annual meeting. Sheraton Hotel, Chicago. Information: 2607 N. High St., Columbus, Ohio.

NOV. 18-21—10*th Exposition of the Air-Conditioning and Refrigeration Industry*. International Amphitheater, Chicago. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C.

NOV. 18-22—*National Warm Air Heating and Air Conditioning Association*, committee meetings and annual convention. Morrison Hotel, Chicago. NWAHACA headquarters: 640 Engineers Bldg., Cleveland 14.

JAN. 27-29, 1958—*American Society of Heating and Air-Conditioning Engineers, Inc.*, 64th annual meeting. Pittsburgh. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St., New York 13.

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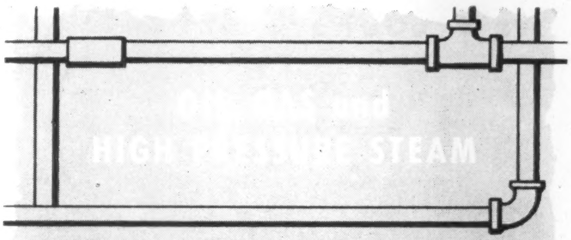

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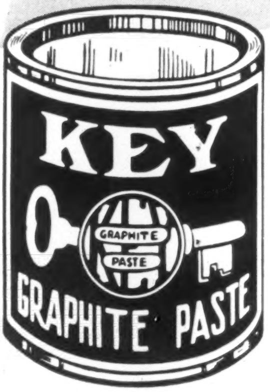

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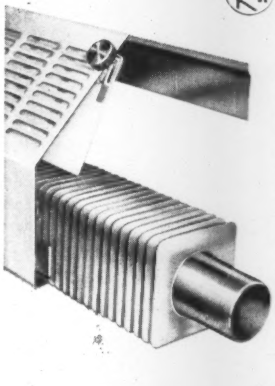

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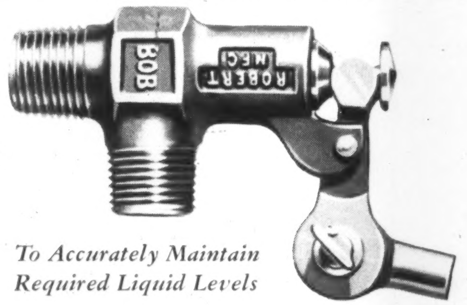

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30° to 60°F	24 Hours
40° to 100°F	7 Days
40° to 100°F	24 Hours
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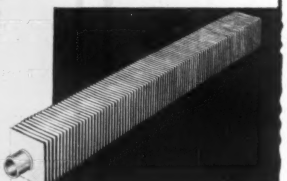

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Blueprint Reading—256 pp. Prepared by Chief of Naval Air Technical Training and Bureau of Naval Personnel. Arco Publishing Co., 480 Lexington Ave., New York 17. $3.00.

Manual of Consulting and Design Engineering Practices—20 pp. Michigan Engineering Society, P.O. Box 573, Kalamazoo, Mich.

Prototype Fan Testing and Computations For Rating Fan Performance—Bulletin 151, Air Moving and Conditioning Association, 2159 Guardian Bldg., Detroit 26. Free.

Building Cost Manual—367 pp. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. $15.00.

Symposium on Steam Quality—ASTM special technical publication 192. 49 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $1.75.

Standard for Testing and Rating Driers for Use in the Liquid Line of Refrigeration and Air Conditioning Systems—ARI standard 710-56. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington 6, D.C. 50c.

Recommendations and Report of the National Committee on Health and Welfare Fund Research—35 pp. United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada, Ring Bldg., Washington 6, D.C.

Environmental Control in the Promotion of Better Working Conditions—By H. H. Schrenk, Ph.D. 3 pp. Industrial Hygiene Foundation, Mellon Institute, 4400 Fifth Ave., Pittsburgh 13. Free.

Modern Mathematics for the Engineer—Edited by Edwin F. Beckenbach. University of California Engineering Extension Series. 514 pp. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. $7.50.

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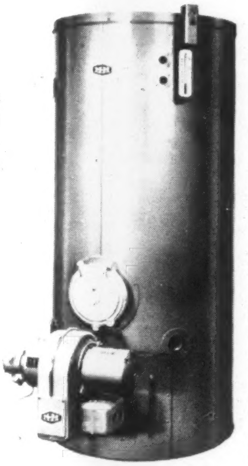

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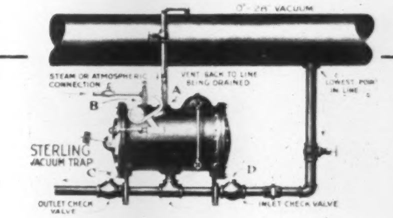

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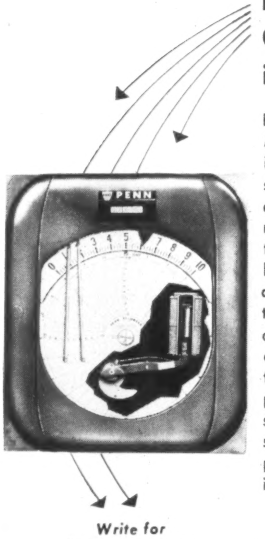

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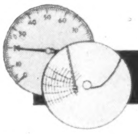

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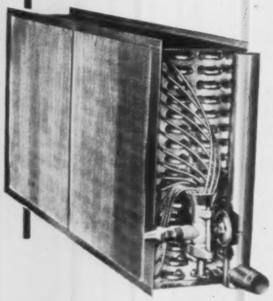

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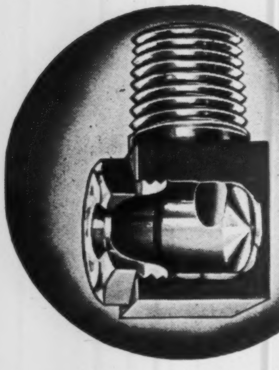

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Methods of Rating and Testing High Side Liquid Line Driers—ASRE standard 35B-56. American Society of Refrigerating Engineers. 234 Fifth Ave., New York 1. $1.00.

Principles of Laboratory Temperature Control. Electronic Relays. Thermistor Operated Temperature Control—Report PB 121120. 55 pp. Office of Technical Services. U. S. Department of Commerce, Washington 25, D.C. $1.50.

Year Book of the Heating and Ventilating Industry—Technitrade Journals, Ltd., 8 Southhampton Rd., London, England.

Method of Testing Desiccants for Refrigerant Drying—ASRE standard 35A-56. American Society of Refrigerating Engineers. 234 Fifth Ave., New York 1. 75c.

Radiation Safety and Major Activities in the Atomic Energy Programs. July-December 1956—Published by United States Atomic Energy Commission. Copies available from Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. $1.25.

ASTM Standards on Zinc-Coated Iron and Steel Products—143 pp. American Society for Testing Materials, 1916 Race St., Philadelphia 3. $2.25.

Your Guide to NEMA Standards Publications—17 pp. National Electrical Manufacturers Association, 155 E. 44th St., New York 17. Free.

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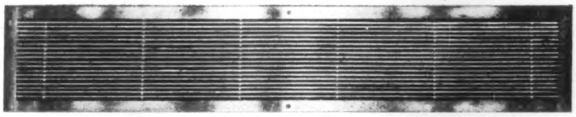

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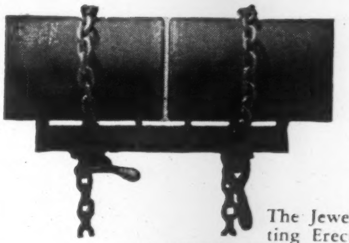

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WANTED: Heating and Air Conditioning Estimator and/or Salesman. Give complete details of education and experience to Joel A. Wier, Jr., White & Wier, Inc., Athens, Georgia.

Mechanical Engineer, 25-40, graduate — to develop and manage mechanical engineering department of firm of Consulting Engineers & Architects (offices in the Upper Midwest and Southwest). Experience in heating, piping and air conditioning desirable. Paid vacations, holidays and sick leave. Group health and hospitalization insurance. Excellent opportunity to grow with the company. Salary open. Mail qualifications to Scott Engineering Company, P.O. Box 863, Watertown, South Dakota. Interviews will be arranged.

A Chicago concern is interested in adding an Engineer to its staff who is qualified to design and prepare plans and specifications for air conditioning installations. For large installations this person would act as project leader and liaison between hired consultants and the company. Other assignments would fall into the mechanical engineering aspects of the building trades. Some experience in contracting would be desirable since supervision of outside contractors would be a part of the job. A college degree in engineering is desirable.

Future responsibility lies in the area of supervision resulting from the company's expansion program. Because of this and the manner in which projects are handled, it is important that the applicant have ability to work with people. Replies to this ad will be held in strict confidence. The company's employees know of this ad. Please send full details of background and experience to Key 1305A, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Ill.

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Overhead Valves without DANGER!

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- Eliminate dangerous catwalks, ladders, balconies, boxes, stools, etc.
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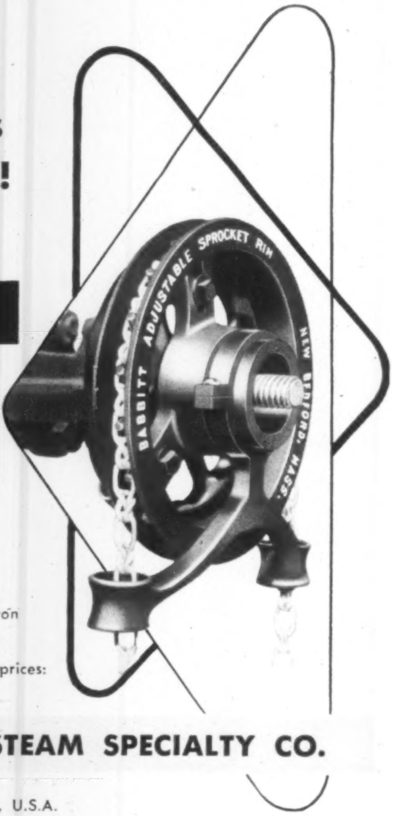

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I'm Cool-air
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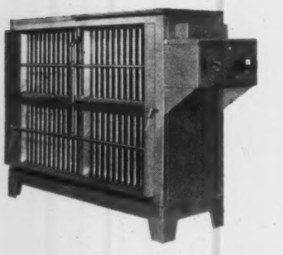

An Electro-air electronic air cleaner installed in any forced air ventilating system keeps walls and ceilings clean for years and prevents unsightly black smudges around diffusers and registers. Employees stay healthier too!

An Electro-air model of suitable dimensions and air cleaning capacity is available for every building area—sizes from 800 cfm to 200,000 cfm.

All parts including selenium rectifiers are guaranteed for five years.

WRITE FOR CATALOG CB-20-B

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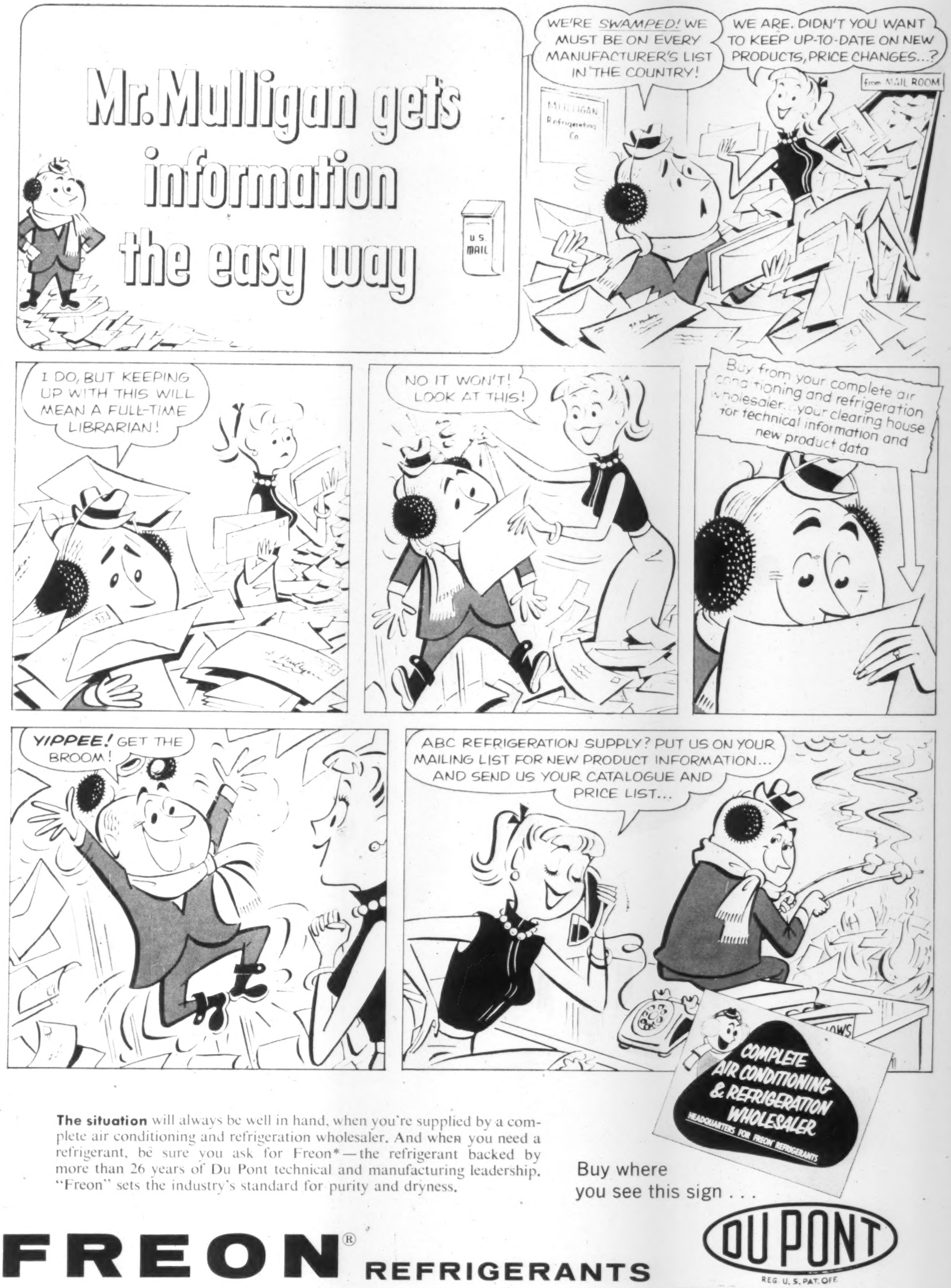
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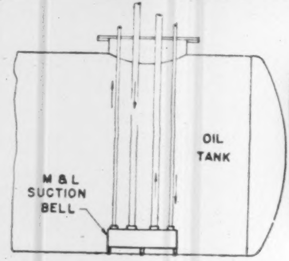

PRESCRIBED FOR ALL HEAVY OIL STORAGE TANKS

M & L Suction Bells are important accessories in any oil burning system, upon which the success or failure of the entire system may depend. Their function is to prewarm the oil in cold weather so as to permit pumping to the oil heater. They are economical units, very simply installed within the storage tank.

M & L Suction Bells are, in effect, localized heating devices with piping connections so arranged that the oil is withdrawn and excess heated oil is returned through it. This combination of coil heating, using steam or hot water, and the return of the excess heated oil from the oil preheater and burner system, affords localized heating without wasteful heating of the entire tank contents. For complete details write for Bulletin 743.

Manning & Lewis *Engineering Company*
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and **BUYING**
INFORMATION

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JANUARY DIRECTORY ISSUE

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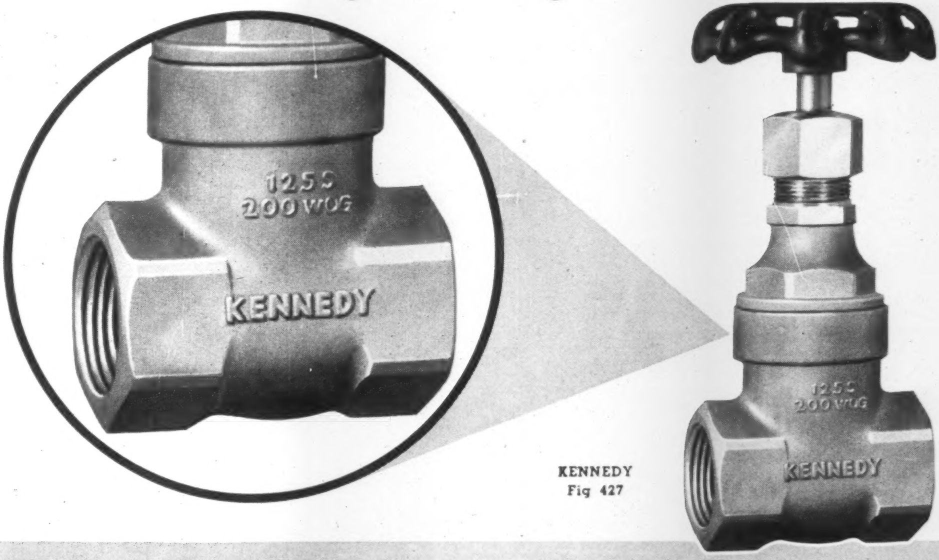
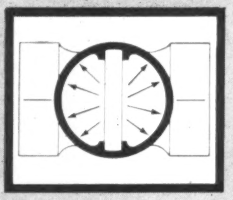
Here's *How* KENNEDY'S New Cylindrical Body Gives You A Stronger, Longer Lasting Valve...

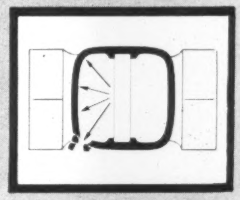


KENNEDY
Fig 427

CYLINDRICAL BODY WITHSTANDS SUDDEN PRESSURE . . .

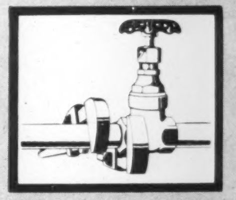


Kennedy's cylindrical body construction when under severe pressure resists rupture and minimizes deflection thus preventing leakage at the seat.

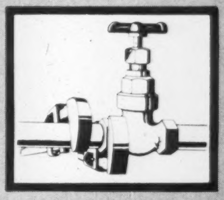


Pressure in ordinary non-cylindrical valve bodies tries to push body wall out to form a circle or a cylinder. Rupturing stresses concentrate where wall has shortest radius. Resultant deflection causes leakage over disc and early failure.

WIDER HEX ENDS, BLENDED INTO BODY, PREVENT DISTORTION . . .



KENNEDY'S wider hex ends are blended into body, making the body and hexes one rugged unit. Thus, extreme wrench pressure is absorbed through the entire rigid valve body.



On conventional valve body, hex ends protrude from body and are connected by thin body wrists. This area, under severe wrench pressure, can distort and cause disc seating trouble.

These *additional* advantages make KENNEDY your best valve buy . . .

Outside diameter of bonnet is recessed from the chamfered outside diameter of the body's bonnet end. Thus, marring, burring or gouging of the outer edge of the body caused by rough handling or hard service cannot interfere with a tight body-bonnet joint. Outside metal skin is left rough for strength after tests showed that machining this surface frequently weakened the valve.

KENNALLOY stem is powerfully inhibited against dezincification. New, improved impregnated plastic packing material that has marked superiority in maintaining resilience and resisting leakage. Unusually deep gland-type stuffing box permits tightness without undue pressure.

Pistol-Grip handwheel provides firm, easy three-way grip on top, sides and bottom.

So, write these outstanding KENNEDY valve features into your valve specifications for long, trouble-free valve performance.

• *YOU CAN'T BUY A BETTER VALVE THAN A KENNEDY!*

KENNEDY VALVE MFG. CO.

1607 E. WATER ST., ELMIRA, NEW YORK

VALVES • PIPE FITTINGS • FIRE HYDRANTS

• OFFICE AND WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO, ATLANTA • SALES REPRESENTATIVES IN PRINCIPAL CITIES •

DAVIS

VALVE SPECIALTIES FOR STEAM, AIR OR GAS

Davis offers a complete line of valve specialties including relief valves, altitude valves, pump governors, pressure regulators and emergency valves. No matter what the control problem, there's a Davis specialty product to meet the need. Contact Davis today for precision control valves.

RUGGED, DEPENDABLE STRAINERS FOR AIR-CONDITIONING SYSTEMS

Davis builds a high quality line of strainers that are ideal for installing in today's modern commercial air conditioning systems. They are easy to service and are available in a wide range of sizes. Three of the most widely used are shown below:

No. 75 "Y" TYPE

Bolted cap "Y" Type Strainer for easy access for cleaning. Blowoff at lowest point—no sediment pocket! Complete range of sizes: 3/8" to 14"... available in semi-steel, bronze or steel bodies, screwed or flanged. Brass, stainless or monel screens. For steam, air, gas or fluids . . . pressures to 1500 psi.

No. 76 BASKET TYPE

The No. 76 Strainer has a cylindrical basket with perforated sides and bottom — easily lifted out for cleaning. Large body passage for low pressure drop. Sizes 1/2" to 24"... bronze, semi-steel or steel bodies . . . brass, stainless, monel steel baskets . . . special meshes available. Ask for recommendations.

No. 77 BASKET TYPE

Similar to No. 76 except for applications where lowest possible pressure drop is desired.

WRITE FOR BULLETIN 800

Davis

DAVIS REGULATOR COMPANY

2541 So. Washtenaw • Chicago 8, Illinois

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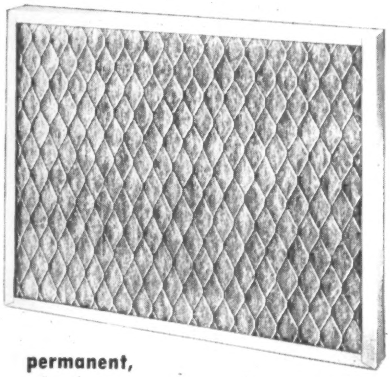
designed to Industry requirements

A-Lum-O-Aire



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Copper AIR FILTER

UL

engineered to industry specifications for all corrosive atmospheres

Here's the filter that solves the problem of air-cleaning in installations involving corrosive fumes, dusts or vapors. Pure COPPER wool media catches and holds *all* the dirt — and the media does *ALL* the filtering. No oils or adhesives required. Never rusts or corrodes. No fire hazard. Saves time; saves money!

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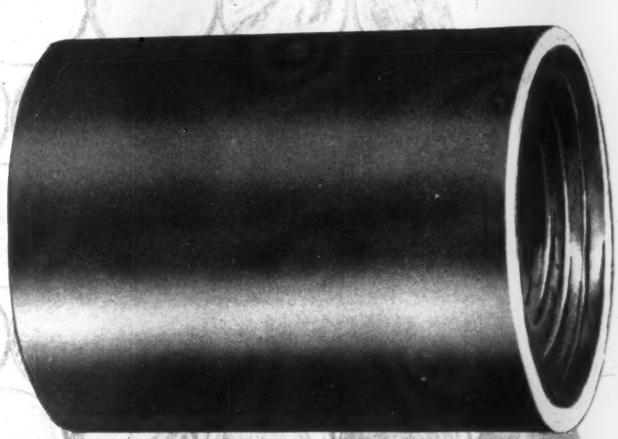
standard and '*HIGH-VELOCITY*' types for every air-cleaning application

Available in ½", 1" and 2" sizes for any filter installation, *A-LUM-O-AIRE* Filters can be engineered to exact specifications for special applications. Also furnished with *aluminum-wool* media for non-corrosive recirculated air applications.

world's largest manufacturers aluminum and copper wool

Carey Electronic Engineering Co.
METAL WOOL DIVISION
(Dept H-5)
1880 Clifton Avenue Springfield, Ohio



pennies add up!

- Clean outside finish
- Continuous even depth thread
- Deep round chamfer
- Heavy galvanized coating
- Pressure tested

Wheatland Precision Steel Couplings by

WHEATLAND STEEL PRODUCTS COMPANY

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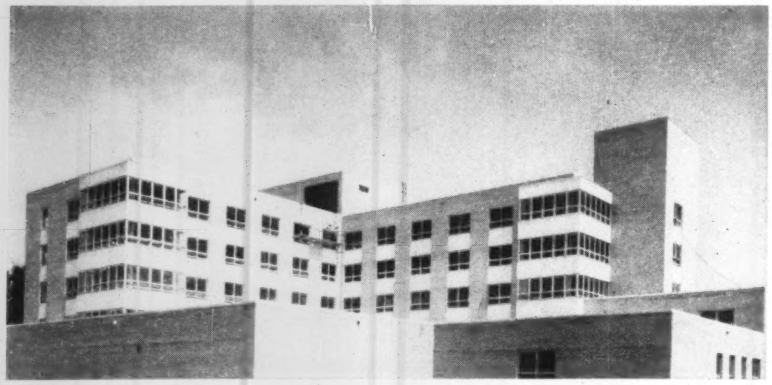
SAVES $50,300...



Savannah Memorial Hospital cuts air conditioning load 74 tons with KoolShade

...100%-fresh-air cooling made economically feasible.

Of the many features of Memorial Hospital, Savannah, Ga., none is more outstanding than its unusual air conditioning. It is primarily a 100%-fresh-air system!

Clearly superior to recirculating systems, 100%-fresh-air cooling has one problem: it requires far greater refrigeration tonnage. Hence it was economically imperative that Memorial seek out every practical means of reducing the load.

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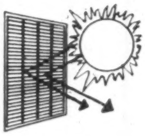

- **unsurpassed shading efficiency** — keeps up to 87% of the sun's rays off windows during the hottest parts of the day: frees air conditioning systems from "hot spot" over-loads, gives relief from heat and glare, protects furnishings from sun-fading.
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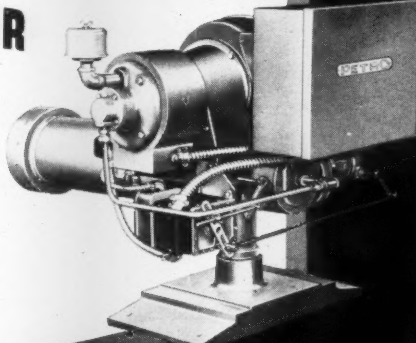

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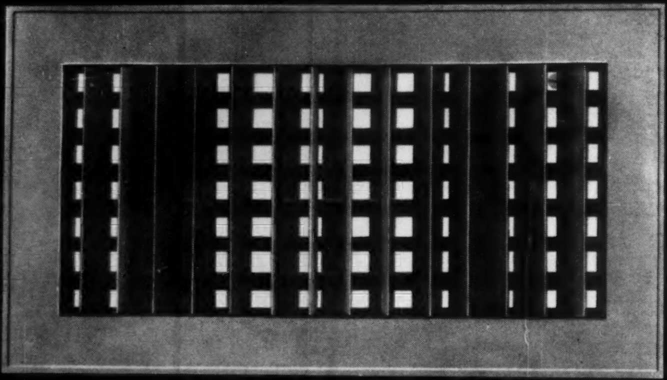

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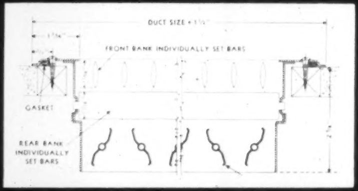
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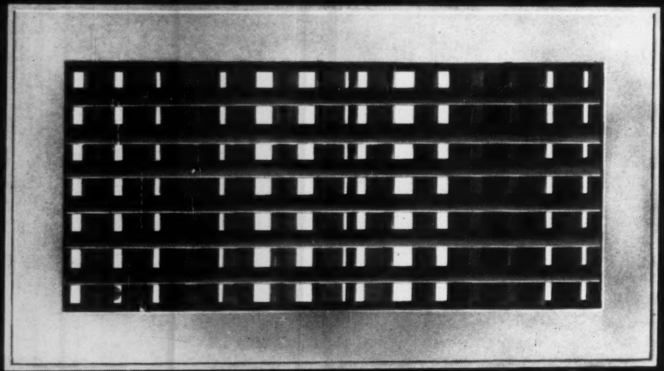

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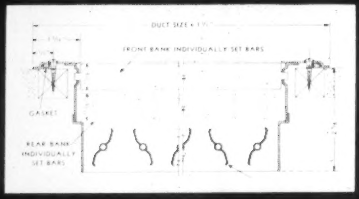
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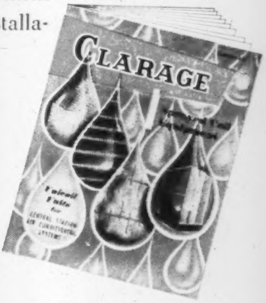

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